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Gravelly
sagebrush burning,
Beaverhead
National Forest,
Madison County,
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DRAFT ENVIRONMENTAL IMPACT STATEMENT

GRAVELLY SAGEBRUSH BURNING
BEAVERHEAD NATIONAL FOREST

Madison County, Montana

MAR 0 8 1991

Lead Agency: USDA Forest Service

Responsible Official:
Mark A. Petroni
District Ranger
Madison Ranger District
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ABSTRACT

The Madison Ranger District of the Beaverhead National Forest has developed four alternatives for prescribed burning of sagebrush, Douglas-fir encroachment, and aspen in the 161,170 acre West Fork Madison and Antelope Basin study area. The study area is located approximately 35 miles south of Ennis, Montana.

Each alternative responds to environmental issues identified during the analysis process. Alternative 1 would take no action; ongoing administrative and management activities would continue in the project area but no burning would be initiated at this time. Alternative 2 would annually burn approximately 3024 acres per year over a 10 year cycle. An average 50% burned and unburned mosaic will be achieved in the burn areas. Alternative 2 produces the greatest amount of forage over time but is the least responsive of the action alternatives in providing vegetative and landscape diversity. Alternative 3, the Preferred Alternative, would burn approximately 1512 acres per year over a 20 year cycle. As with alternative 2, an average 50% burned and unburned moasic will be achieved in the burn areas. Alternative 3 is designed to increase forage production and maintain a broad range of vegetative and landscape diversities. Alternative 4 would burn approximately 1008 acres per year over a 30 year cycle. As with previous alternatives, an average 50% burned and unburned mosaic will be achieved in the burn areas. Alternative 4 produces the least forage of the action alternatives but does maintain a full range of vegetative and landscape diversities. Alternative 4 will essentially maintain the existing condition of the study area.

Comments on this Draft EIS must be received by the District Ranger, at the address above, by

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SUMMARY

PURPOSE AND NEED

Proposed Action:

The Forest Service proposes to prescribe burn approximately 1512 acres of sagebrush, 120 acres of aspen, and 80 acres of Douglas-fir encroachment habitat each year for the next five years in the West Fork Madison and Antelope Basin areas of the Madison Ranger District of the Beaverhead National Forest. The grazing allotments affected by this proposal are: Bufiox, West Fork, Antelope Basin, Conklin, North Saddle, Hidden Lake, Elk Lake, Elk Mountain, Red Rock, and Horn Mountain. This proposal is part of a long term program of habitat management in this area.

There will be from seven to eleven burn units each year that will range in size from 20 to 625 acres. On an average, each of the burn units will contain a mosaic of approximately 50% burned and 50% unburned resulting in an average of approximately 756 of the 1512 acres actually blackened.

Based upon the analysis summarized in this document, the District Ranger, as the deciding officer, will determine whether to and to what extent the areas will be burned. The alternative selected for implementation and the rationale for its selection will be presented in a Record of Decision.

Purpose and Need for Action:

The proposed action was developed to achieve the goals, objectives and standards of the 1986 Beaverhead Land and Resource Management Plan (Forest Plan). More specifically, the proposal has the following purposes:

The proposed action is designed to maintain the quantities of forage needed to sustain permitted numbers of livestock and meet forage needs of big game.

The 10 grazing allotments currently provide forage for 20,131 Animal Unit Months (AUMs) of livestock grazing. The sagebrush/grassland community contributes a major portion of the forage sustaining these AUMs and big game populations. This sagebrush/grassland community must be periodically regenerated to maintain the forage production levels needed to support the livestock and big game populations.

The proposal is consistent with forest wide Goal 6 and Objective 1k on pages II-2 and II-8 of the Forest Plan which respectively state: "Provide opportunities for use of forage by domestic livestock at or above current permitted levels of use while protecting or enhancing fishery habitat, riparian areas, recreation and other forest resources." and "The objective for potential permitted AUMs on the Forest will remain at approximately the current level of 190,000 AUMs."

The proposed action is designed to maintain the diversity of wildlife habitats through (1) maintaining a variety of canopy covers in sagebrush/grassland communities, and (2) maintaining a variety of successional stages in aspen.

One purpose of this proposal is to establish and maintain a diversity of habitats for game and non-game species. Habitat diversity will be provided through maintenance of a variety of successional stages and canopy covers in the sagebrush/ grassland communities.

Another purpose is to initiate the regeneration of decadent stands of aspen to retain the contribution of aspen as an important element of wildlife habitats and vegetative diversity. There are 5,354 acres of aspen in the area comprised of stands from one half acre to 20 acres in size. The aspen is currently well distributed and conditions range from multi-layered and regenerating stands to decadent and non-regenerating stands. Review of past photo and written records indicates that many stands have died out. Field sampling indicates that half of the aspen is in jeopardy of dying out.

This proposal is consistent with forest wide Goal 1 on page II-1 of the Forest Plan which states: "Recognize and promote the intrinsic ecological and economic value of the wildlife and fisheries resources on the Beaverhead National Forest."

and Goal 1a which states: "Provide sufficient diverse habitats to maintain viable populations of all native wildlife species to ensure diversified recreational opportunities and ecological stability."

This document will also disclose and evaluate the effects of the proposed action on the roadless characteristics and wilderness features of inventoried roadless areas.

There are two inventoried roadless areas in the project area. They are Freezeout Mountain areas 1-029A and 1-029B. See pages C-404 thru C-420 of Appendix C to the Final Environmental Impact Statement for the Forest Plan.

Both of the roadless areas noted here were assigned to non-wilderness management prescriptions. The Geographical Display Areas (GDAs) that present the non-wilderness prescriptions are found on pages IV-85 thru IV-90 of the Forest Plan. There are 18 different assigned MAs in these GDAs of which MA 1, 14, and 24 are involved in this proposal.

In addition, none of the wilderness proposals forwarded by the Montana Congressional Delegation in recent years has recommended the Freezeout Mountain area be added to the National Wilderness Preservation System.

Scope of the Proposed Action:

This analysis is the site specific NEPA documentation for a vegetation management proposal to prescribe burn sagebrush, aspen, and Douglas-fir encroachment within the West Fork of the Madison and Antelope Basin Areas. The scope of the proposed action is limited to the burning projects identified in the document. The proposed action is not a general management plan for the area nor is this a programmatic EIS.

This proposal covers approximately 5 years of burning projects in the study areas. These projects are the initial phases of a longer term program of vegetative management that is designed to move toward a desired future condition for the areas. The individual burning projects and alternatives for the 5 year schedule will be presented on a site specific basis as will the discussion of environmental impacts. These individual projects are ready for a decision on whether to proceed.

By considering these projects as part of the longer term strategy, we are able to focus on short and long term objectives, identify the reasonably foreseeable actions for more distant outyears, display potential cumulative effects, and monitor the success of early projects before additional projects are proposed. Any future projects beyond those specifically identified in this analysis will receive complete analysis and disclosure under the National Environmental Policy Act (NEPA).

ALTERNATIVES

Scoping

The alternatives in this document address the issues, concerns, and opportunities that surfaced during both internal and public scoping sessions. Public meetings were held in Butte on February 5, Ennis on February 6, and Bozeman on February 7 of 1990. A news release describing the proposal was sent to organizations and individuals, and a Notice of Intent to Prepare an Environmental Impact Statement was forwarded to the Office of the Federal Registration on April 17, 1990.

Public involvement in this process continued through December of 1990. This included an on the ground review of the project area with the Montana Department of Fish, Wildlife, and Parks. An invitation for an on the ground review was also sent to several groups that had expressed particular concerns about the proposal.

ENVIRONMENTAL ISSUES

Issue 1 Wildlife

How will burning affect the habitats of game and non-game species? Can a program of burning be implemented that will improve wildlife habitats in general? How much can be burned, and when will it be burned?

Issue 2 Landscape Diversity

How will landscape diversity be affected by the proposal? How will the area look in the future? Can the burning projects be designed to establish or mimic a more natural condition?

ALTERNATIVES CONSIDERED BUT NOT GIVEN DETAILED STUDY

Aerial Spraying with Herbicides

Aerial spraying with 2-4-D was used extensively in the area in the 1960's and 70's. However, public and Forest Service awareness of the environmental affects of widespread herbicide use has greatly reduced the desirabililty of this alternative.

The advantage of aerial spraying is the high degree of control it provides for achieving the desired mosaic of treated and untreated areas. This control was not found to outweigh the negative factors of this type of treatment, so the alternative was dropped from further study.

Mechanical Treatment

Mechanical treatment includes activities such as plowing, cabling, or chopping sagebrush with heavy equipment. The advantages of a mechanical treatment are that it provides optimum control over the mosaic of treated and untreated areas and the timing of such treatments are very flexible.

The biggest concern with this alternative is that it creates relatively large areas of disturbed soil, increasing the risk of soil and wind erosion. It is also a very expensive alternative, costing between $50 and $60 per acre treated. Because of these concerns, it was dropped from detailed study.

Accelerated Burning Schedule

In this alternative, nearly all the acres designated for eventually treatment would be burned within a five year period. This alternative would provide the greatest increase in forage production by converting the majority of the area into grasses and forbs. This alternative did not receive detailed study because it did not respond to the stated wildlife and landscape diversity issues.

Natural Fire

The final alternative considered was to allow naturally caused fires to make the desired changes in the vegetation. This alternative would be most responsible to the landscape diversity issue because over time it would re-establish the conditions present before fire control procedures were started.

The problems with this alternative are that it presents a risk to range developments in the area and the wildfires that start here could spread to adjacent areas, including private property, where fire is not desired. There is also no ability to control the timing of fires under this alternative, and could disrupt other management activities such as scheduled grazing programs.

The Beaverhead Fire Management Plan defines the limits where natural fires can be allowed to burn, and within those limits natural fires will contribute to objectives of this proposal. However, total reliance on natural fires is not appropriate so this alternative was not given detailed study.

ALTERNATIVES CONSIDERED IN DETAIL

Features Common to All Action Alternatives--Specific Features and Mitigation Measures

Wildlife

A 150 foot buffer of unburned sagebrush will be provided around wet meadows.

If Sage Grouse breeding sites (leks) are found (none are known to exist in the area), they will be protected by a 1.5 mile radius unburned buffer.

The Ferruginous hawk, a sensitive species, nests in the upper reaches of the West Fork Madison River. Units will not be burned in the spring if nests are discovered in or within 300 yards of a unit. In addition, those nests will be protected during fall burning so the site is not destroyed.

Units in the upper reaches of the West Fork Madison River will not exceed the 40-60% burned mosaic to protect habitat for prey species of the Ferruginous hawk.

Three units in the Conklin and Elk Lake areas will be burned in the fall to prevent disturbance of Trumpeter Swan and Bald Eagle nest sites.

Diversity

To establish diversity within individual burn units, burning will be designed to achieve a mosaic of 40-60% burned.

Livestock Management

To ensure that this proposal provides additional forage for wildlife, no increase in livestock numbers will be permitted.

Watershed

To minimize the risk of increased sedimentation of streams, a 50 foot buffer of unburned area will be maintained around streams on slopes of 0-15%. When slopes exceed 15% the unburned buffer will be increased to 100 feet.

Monitoring

Sagebrush Mosaic

Post burn walk-throughs and photography will be conducted directly after the burn to developed detailed mapping of burn mosaic for every unit.

Sagebrush Re-establishment

Vegetation transects will be established on selected sites one year after burning and will be reread every five years. The transects will measure the density of sagebrush plants by age class and the total sagebrush canopy cover. At least one transect site will be established each year.

Aspen

Stands will be monitored by a general walk through survey with quick plots to measure aspen sucker numbers and livestock/big game use. Select sites will be measured the first fall after burning and re-measured yearly for three years.

Sage Grouse

An existing program of reporting all sage grouse observations in the area will continue to determine if there are any measurable reactions of the grouse to burning activities.

Elk

The Montana Department of Fish, Wildlife and Parks, in coordination with the District Wildlife Biologist, will continue a radio location study of elk calving in the area. The study will attempt to monitor the reaction of elk to burning projects and any long term changes in elk movement or calving patterns in the area.

ALTERNATIVE DESCRIPTIONS

Alternative 1 - No Action

Alternative 1 would not initiate any burning in the project area. Forage production in the area would gradually decline under this alternative and vegetation would be late successional stage.

Alternative 2 - 10 Year Burning Cycle

Alternative 2 would conduct mosaic burning on approximately 3024 acres per year over a 10 year cycle. This alternative would provide the greatest increase in forage production and would maintain about 1/3 of the area in early successional stage vegetation.

Alternative 3 - 20 Year Burning Cycle

Alternative 3 would conduct mosaic burning on approximately 1512 acres per year over a 20 year cycle. Forage production would improve over current conditions and a broad spectrum of successional stages would be maintained.

Alternative 4 - 30 Year Burning Cycle

Alternative 4 would conduct mosaic burning on approximately 1008 acres per year over a 30 year cycle. Forage production would be slightly improved over current conditions and a broad spectrum of successional stages would be maintained with an emphasis on late successional stages.

AFFECTED ENVIRONMENT

INTRODUCTION

The project area lies approximately 35 miles south of Ennis, Montana in the Antelope Basin and West Fork Madison areas of the Madison Ranger District. This section describes the existing condition of the environment and the resources that may be affected by the proposed project.

WILDLIFE

Affected Area

Direct and indirect effects were considered on 42,168 acres of sagebrush communities that encompass the 30,240 acres of projected burning. Cumulative effects were analyzed within the entire Antelope Basin and the southern end of the Gravelly Range in the West Fork Madison area, a total of approximately 161,170 acres.

The area supports diverse wildlife habitats and is dominated by sagebrush/grasslands with patches of aspen and conifers. There are nine lakes found within the area. Big game habitat from spring to fall is provided for mule deer, antelope, elk, and moose. The area also provides habitats for a wide variety of small mammals and songbirds.

Past Management

Livestock grazing has occurred in the area for many decades. Large areas of sagebrush were sprayed in the 60's and 70's to increase forage production. Several thousand acres of wyethia were also sprayed during this time and into the 80's. Recently, burning has been used on mature sagebrush in the area.

The entire area is managed under an area restriction with many specific roads and trails also restricted to motorized use.

Existing Condition

Big Game

Mule deer and antelope use the area in the spring, summer and fall. There is no permanent winter range. Sagebrush is used for cover, but does not appear to be a primary food source. This is probably due to the presence of more palatable, succulent forbs.

The area provides yearlong habitat for moose. In the fall and winter moose are primarily found in the riparian areas.

The existing antelope habitat suitabililty, as described using the U.S. Fish and Wildlife Habitat Suitability Index model, is rated at .65 out of a possible score of 1.00.

Management Indicator Species

Elk calving locations have been mapped by the Montana Fish, Wildlife and Parks. No particularly high concentrations have been identified in Antelope Basin, although the heads of Antelope, Anthill, and Poison Creek seem to be preferred. The West Fork Area has a concentration of calving locations on the south facing breaks between Teepee and Lobo Creek. Past sagebrush spraying and burning projects have shown no adverse effects on elk populations, which are at the desired level for the Gravelley Planning Unit. Elk migrate out of the area to winter, although small herds stay in the West Fork area during mild winters.

Pine marten are found in the area in mixed species stands of mature timber dominated by Englemann spruce and alpine fir. Sagebrush and grassland habitats are not important to pine marten and no effects to pine marten are expected from the burning projects.

Sage grouse appear to have gone through wide fluctuations in the area over the past several decades. Current populations are low and appear stagnant. There is a low amount of brood habitat and a very limited amount of riparian areas, which are important feeding sites. No leks have been located within the drainage. Considering the increasing acreage of sagebrush and the low populations of grouse, it is doubtful that the condition of sagebrush itself is the present limiting factor in grouse populations. The deteriorating condition of the winter range, which is located in Idaho on private lands, is undoubtedly a much more important factor.

Goshawk undoubtedly nest in the conifer stands in the upper reaches of the area, although no nest sites have been found. Goshawks are primarily a forest bird, although they occasionally hunt meadow edges and aspen stands.

Trumpeter swan nest on Conklin and Elk lake, and will winter on Cliff Lake until it freezes over. The activities of the young are completely restricted to Conklin and Elk lake until after fledging.

Sensitive Species

Sensitive species that may be in the area include the boreal owl, harlequin duck, ferruginous hawk, trumpeter swan, western big-eared bat, and the spotted bat. It is not expected that any of the action alternatives will impact the boreal owl, spotted bat, western big-eared bat, or harlequin duck. The fueruginous hawk are fairly common in the area and feed primarily on rabbits. Nesting preference is trees in shrubland/grassland habitat, but they will nest in stream bottoms or on the ground when trees are not available.

Threatened and Endangered Species

Grizzly bear habitat is excellent in the Gravellies, but because of past human activities the grizzly is considered an incidental user with about one sighting reported every two years. The Gravellies are not listed in a Situation Management Recovery Area. There are several areas that probably have the potential to hold bears for part of the year, but the transportation system and conflicts with grazing would probably be the limiting factors for grizzly bear in the area.

Wolf have regularly been reported in the Gravelly Range, the last being about two years ago. A total of 164 sightings have been reported since 1964 on the Beaverhead National Forest. No pack activity has been reported so the population is probably low and scattered if present at all.

Bald Eagles have been studied around the area lakes since 1988 in an effort to make a nest plan for each of the eagle nest sites. The habitat can probably support up to four nesting pairs of eagles.

Peregrine falcon are occasionally reported in the area, although no nests have been found. Several pairs have been artificially planted nearby and one natural pair nests near the Centennial Valley. Because of these birds and the abundance of waterfowl in the area lakes, there is a good chance of peregrines nesting on the forest now or in the near future.

LANDSCAPE DIVERSITY

Affected Area

The affected area includes all 161,170 acres in the West Fork/Antelope Basin area. The proposed action is confined to 30,240 within 42,168 acres of sagebrush/grassland communities and a small amount of conifer/grass and aspen communities. The areas to be treated are in the southern half of the affected area.

Past Activities

Past activities affecting the natural landscape diversity of the area include livestock grazing, sagebrush and wyethia treatment with herbicides and fire, aspen regeneration treatments, conifer encroachment treatments, and fire suppression.

Existing Condition

Overall landscape diversity in the West Fork/Antelope Basin is quite high, and includes grasslands, wet meadows, sagebrush/grass slopes, willows, aspen stands, open conifer/grasslands, and dense coniferous forests. The topography is also very diverse, with elevations ranging from 6,000 to 10,000 feet.

The project area, the southern portion of the affected area, is dominated by large open basins and high flat benches of sagebrush/grass and grasslands with scattered patches of dense conifer forests and aspen stands. Canopy cover provides the greatest amount of landscape diversity within the sagebrush/grass areas. Canopy covers in the area are fairly evenly distributed from 0 to 5% canopy cover to over 30% canopy cover. Fire suppression has led to an increase in the acreage and density of conifer stands in the area since the 1940's.

VEGETATION

Affected Area

The proposed action would affect sagebrush/grass, open conifer/grass, and aspen vegetation types within management areas that allow prescribed burns for habitat improvement. Mountain Big Sagebrush is the dominate sagebrush in the area and is the target species for fire treatment.

Idaho Fescue is the dominate grass species in the area, although many other species are present. There are a very high number of forb species in the area, dominated by Sticky Geranium, Soft Cinquefoil, and Silky Lupine.

About 1622 acres of conifer encroachment, dominated by Douglas-fir, have been identified within burn units. Aspen stands from 1/2 acre clones to 10-20 acres stands are scattered throughout the area. Natural regeneration events, such as fire, are required to maintain many of the aspen sites. Without such regeneration the aspen sites would be naturally replaced by conifer or sagebrush/grass vegetation.

Past Activities

For over 80 years the area has been grazed by livestock. An approved management plan using deferred or rest rotation grazing systems exists for all nineteen allotments in the area. A total of 25,169 AUMs are grazed here.

From 1959 to 1980 about 21,168 acres of sagebrush and 5,520 acres of Wyethia were treated with herbicides. From 1982 to 1988 about 6491 acres of sagebrush were burned in the West Fork/Antelope Basin area. A very limited amount of control on conifer encroachment and aspen regeneration was also done at this time in conjunction with the sagebrush burning. Less then 40 acres of conifers and 50 acres of aspen were treated. In addition, 165 acres of aspen have been treated since 1989 by cutting down mature live trees.

Existing Condition

Vegetation conditions in the area are generally good, although aspens stands conditions are quite varied. There has been close to a 50% decrease in aspen stands since the 1940's, and a 1989 survey of aspen stands in the area identified half of the 258 stands sampled in jeopardy of dying out. There are decadent aspen stands, conifer encroachment, and large expenses of dense sagebrush that can partially be attributed to the lack of natural fire.

Threatened, Endangered and Sensitive Plants

Three species of sensitive plants have been found in the study area, but none of the sites are located in proposed burning units. Two other species may occur in the sagebrush/grassland habitats, but have not been found in the area.

WATER AND FISH

Affected Area

Portions of the West Fork Madison River, Antelope Creek, and Elk Creek watersheds comprise the affected area for these resources. The streamflows are low and relatively constant, with peak runoff in May and June when streamflow may increase tenfold. Most stream channels are stable, although the main channel of the West Fork has unstable banks along most of its length.

Past Management

Overgrazing of the area prior to the early 1960's led to surface erosion and channel widening on the West Fork. More intensive livestock management practices were introduced in the 1960's and improved watershed conditions to a level that they are maintained today.

ROADLESS AREA

Affected Area

The proposed action will affect the 95,098 acre Freezeout Mountain area, 1-029. This area has been assigned to a mix of resource emphases, with 65% of the area having a range or wildlife emphasis. It includes the Cliff Lake Research Natural Area located in the Antelope Basin area.

Past Management

Past management has emphasized grazing, wildlife, and recreation values. Many miles of fence and numerous water developments, as well two cabins for stockmen, have been constructed for livestock management. Aspen treatments and spraying and burning of sagebrush have occurred since the 1960's. Since the 1977 RARE II inventory, 2810 acres were removed from roadless designation due to timber harvest and road construction activities.

A system of trails was developed to provide recreation and administrative access, and miles of old "wheel track" roads cross the area. The area is closed to motor vehicles except on designated roads or trails and specific areas that are open to snowmobiles.

This area has not been recommended for wilderness designation in the Forest Plan or in any of the proposed Montana wilderness bills.

Existing Condition

The natural integrity of the area has been heavily impacted by the grazing, fire suppression, and vegetation treatment activities that have been occurring in the area for many years. Man-made elements, such as fences, cabins, etc., have also detracted from the natural integrity.

The overall appearance of the area is quite natural. The cattle and man-made elements seen here are not viewed as significant intrusions, but are expected elements of the setting.

The easy access to the area and open terrain offer minimal opportunities for experiencing a remote setting. Heavy recreation use in the area also limits the opportunities for solitude.

A major portion of the area could be managed as Wilderness. Livestock grazing and range improvements would remain a part of the setting.

LIVESTOCK MANAGEMENT

Affected Area

The proposed action would affect 10 of the 19 allotments in the area.

Past Management

Aerial spraying was done in the 60's and 70's to kill sagebrush. Rest rotation and deferred grazing systems were implemented in the 60's to improve livestock management.

Existing Condition

All of the allotments are under intensive management systems and have approved Allotment Management Plans. The range conditions of the allotments have an overall rating of good to excellent; however, conditions are changing. Sagebrush canopies are beginning to close and forage production is decreasing.

AIR QUALITY

Affected Area

The project would affect Airshed 7 of the Montana Airshed Group, which includes Beaverhead, Madison, and the southern third of Jefferson Counties.

Past Management

There have been no violations of air quality standards. Wildfires and prescribed burns have occasionally caused local air quality deterioration.

Existing Condition

The ambient air quality is good to excellent. The area has a wind power rating of 6, the highest in the state. Wind speeds should be adequate for dispersion of potential pollutants.

ENVIRONMENTAL CONSEQUENCES

EFFECTS COMMON TO ALL ACTION ALTERNATIVES

Wildlife

Moose should benefit from aspen regeneration, but there will probably be no measurable affect on moose populations.

Ruffed and blue grouse should respond positively to the burning since it will diversify age classes in aspens and increases forb production.

Elk populations should not be impacted by the burning since the area is not key winter range.

Sage grouse could be impacted by the burning. However activities further reducing winter range, which is outside of Forest Service boundaries, are most likely to limit grouse numbers.

Goshawk could be impacted if all mature aspen are removed since they occasionally use this habitat for nesting and perching. This impact will be mitigated by buffering the regenerated stands until the trees have matured.

Trumpeter swan could be impacted if units near nest sites are burned in the spring; three units near nest sites have been identified. Fall burning will be done on these units to mitigate adverse affects.

Ferruginous hawk populations could be adversely affected by disturbance to nest sites caused by burning activities and the reduction of prey species from excessive burning. Units burned in the spring will need to ensure that at least a 300 yard buffer between the burns and nest sites is maintained. Trees used for nesting will have to be protected during fall burning. To maintain healthy rabbit populations required by the hawks, it is important not to exceed a 40 to 60% burn mosaic on individual units.

There is one burn unit that could impact an active bald eagle nest. To mitigate this affect the burn could be done in the fall.

The action alternatives should not impact pine marten, boreal owl, harlequin duck, spotted bat, Western big-eared bat, grizzly bear, peregrine falcon, or gray wolf.

Vegetation

The target species, Mountain Big Sagebrush, is easily killed by even low intensity fires burning beneath the shrub crown. Two other sagebrush species common to the area, Silver and Three-tip, can sprout after fire, but past experience in the area shows that sprouting by these species is limited. Other shrub species found in the area do sprout and generally are only slightly damaged by fire.

Grasses and forbs generally respond positively to fire. For the first two or three years after burning the vegetation is highly palatable to grazing animals. This preference by livestock to burn areas should decrease pressure on sensitive areas, such as riparian zones.

Fire can be an effective tool in regenerating aspen stands. Aspen suckers are highly selected as browse by livestock and wildlife to the point that concentrated browsing can severely damage the aspen and negate the benefits of the treatment. To control overuse, the timing and intensity of livestock use will have to be controlled and large enough areas need to be treated to prevent wildlife from congregating in small areas.

Burning in Douglas-fir encroachment will be designed to kill seedling but protect most saplings. This will maintain the area as an open stand of scattered Douglas-fir with sagebrush/grass understory.

The potential for damage to sensitive plants in the area is very low if burning is done in early spring or late fall while the plants are dormant.

Livestock Management

The action alternatives will result in increased forage production. Livestock numbers will remain constant, so more forage will be available for wildlife. Livestock distribution is expected to follow burning areas, which should reduce pressure on riparian areas.

Watershed

Increases in water yield or sediment resulting from the proposed actions will have negligible effects on water or fishery resources. Burn units make up less then 5% of area, and on the average only 50% of those units will be burned. Buffers zones of 50 feet on level ground and 100 feet on slopes over 15% will provide adequate filtering for any increased erosion that does occur.

Roadless

None of the action alternatives would remove the area from future wilderness consideration. The descriptive features of a roadless environment would remain essentially unchanged from current conditions.

Air Quality

The proposed burning will cause smoke to be evident in the air for a period of time. Emissions will be subject to the coordinating requirements of the Montana Smoke Management Memorandum of Agreement dated July 31, 1978.

DIRECT AND INDIRECT EFFECTS BY ALTERNATIVE

Alternative 1 - No Action

Big game species populations are not likely to change since the area is not winter range. Moose may use the area less frequently as aspen die out. The current antelope habitat rating of .65 out of 1.00 would fall to .46 after 20 years and then could improve to .52 after 30 years if older stands of sagebrush die off as some have predicted.

Non-game and small game species that depend on aspen stands (e.g., ruffed grouse, western bluebirds, sapsuckers) or savannah/grassland habitat (e.g., meadowlark, horned lark, morning dove) would decrease in population. Species dependent on sagebrush (e.g., Vesper sparrow, Brewer's sparrow, sage thrasher) would increase in population. Sage grouse could be be affected by a decrease in forbs available and in the condition of the riparian areas as livestock and wildlife concentrate in those areas.

No impact on sensitive, threatened, or endangered species are predicted.

Landscape diversity will decrease in both vertical and horizontal structure. The landscape will be dominated by large expanses of heavy shrub with scattered small, unconnected openings. Up to 50% of the aspens stands could die out. Conifer encroachment would increase and the sites would convert to closed canopy stands.

The dense sagebrush stands would be a natural barrier to livestock and would encourage heavier grazing in the open pockets and riparian areas. Livestock numbers would have to be reduced by 18% because of decreased forage production.

Alternative 2 - 10 Year Burning Cycle

Mule deer will be more vulnerable during the hunting season because of reduced cover. The habitat suitability for antelope will increase from .65 to .82 after 30 years of implementing this cycle. The effects on elk would be limited to calving. The increase in elk populations in the area following the intense spraying of the 60's and 70's and the low depredation of elk calves in this area indicate that elk should not be adversely impacted by this alternative

Because this alternative uses a higher then "natural" burn rate, the diversity of small game and non-game wildlife will probably be reduced. The populations of species dependent on grasslands should increase. Research on the impact of burning on sage grouse populations is inconclusive. Buffer zones around critical sage grouse habitat would be used to minimize negative impacts.

The landscape mosaic in this alternative would be dominated by a more open, grassy appearance with scattered small shrubs. The density of sagebrush would decrease along with the vertical and horizontal structure. Aspen stands would improve. Areas of conifer encroachment would remain essentially in the current condition, with an open park-like appearance.

Forage production would improve significantly over current conditions. Because livestock numbers would not change, this additional forage would be available for wildlife.

Alternative 3 - 20 Year Burning Cycle

The vulnerability of mule deer should be about the same as the no action alternative. The antelope habitat index would improve to .84 from the current .65 rating. There will be better elk calving habitat then provided by Alternative 2.

Small game and non-game species preferring either old sage or grassland and young sage could benefit from this alternative. This alternative has the potential of improving sage grouse habitat as long as planned mitigation measures are followed.

This alternative would produce a fairly even mix of different shrub densities. The dominate view would be of grass dominated openings intermixed with moderate to dense stands of sagebrush. The affects to aspen stands and conifer encroachment would be similar to Alternative 2.

Forage production would increase over current levels and the highly desirable new growth would be spread out over a larger area, improving the distribution of livestock. Livestock numbers would not be increased, so the additional forage would be available for wildlife.

Alternative 4 - 30 Year Burning Cycle.

Mule deer populations should not be impacted in any way. The antelope Habitat Suitability Index would be .78 as compared to the current .65 rating. The reduced burn areas would tend to concentrate elk in the spring to the recent burn units. Adverse impacts on elk calving should be less than Alternative II or III.

Small game and non-game species that depend on grassland habitat would not benefit compared to present condition, but sagebrush dependent species could. Sage grouse habitat could be improved.

The visual landscape effects will be similar to Alternative 3, but there will be a general dominance of the heavier shrub densities. Some aspen stands could die out before they are treated with fire. Conifer encroachment would tend to a higher density and increased canopy closure.

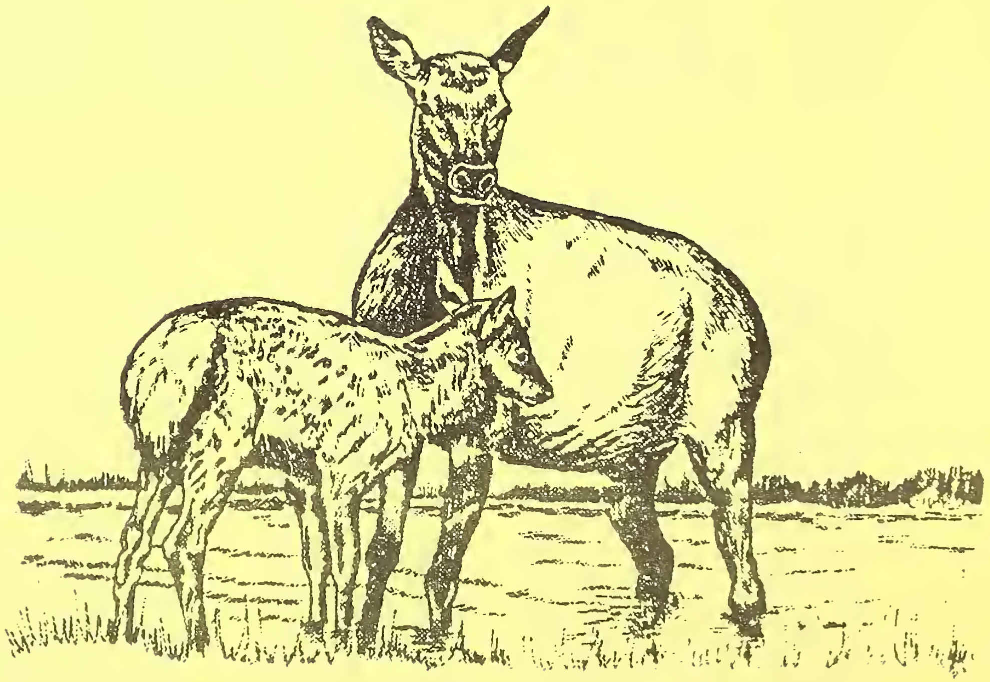
This alternative would essentially maintain the existing conditions relative to livestock management. The mosaic of burned areas should help disperse livestock, but not to the degree of the other action alternatives.

Table II-12. Comparison of Alternatives Summary.

Measurement Indices	Alt 1	Alt 2	Alt 3	Alt 4
Wildlife				
Antelope Habitat Index (Existing =.65)	.52	.82	.84	.78
Antelope Habitat Quality	Decrease	Increase	Increase	Increase
Acres Burned in Elk Calving Areas	0	2613	1962	1217
Overall Effect on Elk Populations, Herd Structures	0	0	0	0
Overall Quality of Sagegrouse Habitat	Decrease	Decrease	Increase	Increase
Overall Change in Mule Deer Habitat	0	Decrease	0	0
Total Pounds of Forage Produced	25,703,150	38,556,000	33,735,650	31,058,150
Change in AUMs Available for Other Resources	- 3654	+ 4585	+ 1495	- 222
Landscape Diversity				
Maintenance of Aspen	Could Lose	Maintains	Maintains	Maintains
Acres of Sagebrush in Burn Units (Years 1-5)	0	14,994	8312	5766
Acres Actually Blackened in Mosaic	0	7497	4156	2883
Percent of 42,168 Acres of Sagebrush Blackened	0	18%	10%	7%
Percent of Alternatives in Major Successional Stages Early Mid Late	 0% 0% 100%	 36% 9% 55%	 18% 9% 73%	 12% 6% 82%

CHAPTER I

Purpose and Need



CHAPTER 1 -- PURPOSE AND NEED

Proposed Action:

The Forest Service proposes to burn sagebrush on approximately 1512 acres per year for the next five years in the West Fork Madison and Antelope Basin areas of the Madison Ranger District of the Beaverhead National Forest. The 1512 acres will be made up of several individual burn units distributed over 10 grazing allotments. The number of units burned annually will range from seven to eleven and unit sizes range from 20 to 625 acres. The grazing allotments involved are Bufiox, West Fork, Antelope Basin, Conklin, North Saddle, Hidden Lake, Elk Lake, Elk Mountain, Red Rock, and Horn Mountain. On an average, each of the burn units will contain a mosaic of approximately 50% burned and 50% unburned resulting in an average of approximately 756 of the 1512 acres actually blackened.

The Forest Service also proposes to regenerate an average of 120 acres of aspen and set back an average of 80 acres of Douglas-fir encroachment per year with burns in the same areas. In most cases, the aspen and Douglas-fir treatments are adjacent to or within sagebrush burning units and will be accomplished in conjunction with the sage burns.

The specific burning proposals that will be analyzed in this document are the first 5 years of a long term program of sagebrush, aspen, and Douglas-fir manipulation in the Westfork and Antelope Basin areas. A broad overview of the project area is shown on the enclosed Vicinity Map.

The detailed environmental analysis documented in this Environmental Impact Statement began with the identification of the proposed action. The proposal to burn sagebrush, aspen and Douglas-fir encroachment is based on agency knowledge of the existing condition of the area, Forest Plan direction, and opportunities identified by the Forest Service and the public during the West Fork Madison and Antelope Basin Implementation Analyses. The project files for the Implementation Analyses are available for review on the Madison Ranger District.

Based upon the analysis summarized in this document, the District Ranger, as the deciding officer, will determine whether to and to what extent the areas will be burned. The alternative selected for implementation and the rationale for its selection will be presented in a Record of Decision.

Purpose and Need for Action:

The proposed action was developed to achieve the goals, objectives and standards of the 1986 Beaverhead Land and Resource Management Plan (Forest Plan). More specifically, the proposal has the following purposes:

The proposed action is designed to maintain the quantities of forage needed to sustain permitted numbers of livestock and meet forage needs of big game.

The 10 grazing allotments currently provide forage for 20,131 Animal Unit Months (AUM's) of domestic livestock grazing. The sagebrush/grassland community contributes a major portion of the forage sustaining these AUM's and big game populations.

The recovery of sagebrush canopy covers in areas sprayed in the past will reduce forage production. As a result, the carrying capacities on grazing allotments for domestic livestock are reduced as well as the amount of forage available for big game. Encroachment by Douglas-fir into the sagebrush/grassland communities will further reduce the production of forage. Continued encroachment would eventually convert the sites to a Douglas-fir/pine grass community. See Chapter III discussions of existing condition.

Burning the sagebrush and Douglas-fir encroachment is needed to improve the production of forage and maintain the capacities of the grazing allotments to carry the permitted numbers of livestock and provide adequate forage for big game.

The proposal is consistent with forest wide Goal 6 and Objective 1k on pages II-2 and II-8 of the

Forest Plan which respectively state: "Provide opportunities for use of forage by domestic livestock at or above current permitted levels of use while protecting or enhancing fishery habitat, riparian areas, recreation and other forest resources." and "The objective for potential permitted AUM's on the Forest will remain at approximately the current level of 190,000 AUM's."

The proposal is also responsive to the Desired Future Condition of the Forest for domestic livestock as described on page II-23 of the Forest Plan. The desired future condition for domestic livestock in decade one is noted in part as: "In the first decade, domestic livestock grazing capacity will remain at the existing level of about 190,000 AUM's, assuming management objectives for winter range and riparian areas can be achieved through implementation of grazing systems and range improvements."

Page 17 of the Record of Decision also provides for investments in nonstructural improvements such as prescribed burning to enhance forage production. The Forest Plan also provides direction for MA's 1, 14, and 24 that includes range improvements as an appropriate management practice and prescribed fire as an appropriate tool.

The proposed action is designed to maintain the diversity of wildlife habitats through (1) maintaining a variety of canopy covers in sagebrush/grassland communities, and (2) maintaining a variety of successional stages in aspen.

Of the 42,168 acres of sagebrush/grassland communities, 25,096 acres or 60% are in mid to late successional stages where canopy coverage is 11% or greater. This current distribution is primarily due to the recovery of sagebrush on many of the 21,168 acres of sagebrush sprayed in the late 1960's and early 1970's. Continued fire suppression efforts have also contributed to the recovery and current distribution of sagebrush in the area. See Chapter III, Vegetation, for a more detailed discussion of the existing condition.

One purpose of this proposal is to establish and maintain a diversity of habitats for game and non-game species. Habitat diversity will be provided through maintenance of a variety of successional stages and canopy covers in the sagebrush/grassland communities.

Another purpose is to initiate the regeneration of decadent stands of aspen to retain the contribution of aspen as an important element of wildlife habitats and vegetative diversity. There are 5,354 acres of aspen in the area comprised of stands from one half acre to 20 acres in size. The aspen is currently well distributed and conditions range from multi-layered and regenerating stands to decadent and non-regenerating stands. Review of past photo and written records indicates that many stands have died out.

This proposal is consistent with forest wide Goal 1 on page II-1 of the Forest Plan which states: "Recognize and promote the intrinsic ecological and economic value of the wildlife and fisheries resources on the Beaverhead National Forest." and Goal 1a which states: "Provide sufficient diverse habitats to maintain viable populations of all native wildlife species to ensure diversified recreational opportunities and ecological stability."

This proposal is also consistent with Objective 1a on pages II- 3 and 4 of the Forest Plan which states in part: "Viable populations of all existing wildlife species will be maintained by providing a diversity of habitats throughout the Forest."

The proposal is also responsive to the Record of Decision, page 9 and to the desired future condition of the forest as noted on page II-21 of the Forest Plan. The desired future condition for decade one of Forest Plan implementation notes that, "Timber harvest, prescribed burning, wildlife habitat improvement projects and natural successionary forces will have combined to regenerate and rejuvenate some mature and overmature habitats."

The proposed actions will occur in Management Areas (MA's) 1, 14, and 24. The descriptions, management goals, and standards for both these MA's provide for the maintenance and enhancement of wildlife habitats and the use of prescribed fire as a method of accomplishment. Refer to pages III-2 thru III-4, pages III-44 thru III-46, and pages III-76 thru III-78 of the Forest Plan. A more detailed summary of Forest Plan direction is also provided in Chapter III.

This document will also disclose and evaluate the effects of the proposed action on the roadless characteristics and wilderness features of inventoried roadless areas.

There are two inventoried roadless areas in the project area. They are Freezeout Mountain areas 1-029A and 1-029B. See pages C-404 thru C-420 of Appendix C to the Final Environmental Impact Statement for the Forest Plan.

The Forest Plan established Forest-wide multiple use goals, objectives, and management area requirements as well as management area prescriptions. The analysis of roadless lands, documented in Appendix C, described each roadless area, the resources and values considered, the range of alternative land uses studied, and the effects of management under each alternative. As a result of the analysis, some roadless areas were recommended for inclusion in the National Wilderness Preservation System and others were assigned various non-wilderness prescriptions.

Both of the roadless areas noted here were assigned to non-wilderness management prescriptions. The Geographical Display Areas (GDA's) that present the non-wilderness prescriptions are found on pages IV-85 thru IV-90 of the Forest Plan. There are 18 different assigned MA's in these GDA's of which MA 1, 14, and 24 are involved in this proposal.

In addition, none of the wilderness proposals forwarded by the Montana Congressional Delegation in recent years has recommended the Freezeout Mountain area be added to the National Wilderness Preservation System.

Scope of the Proposed Action:

This analysis is the site specific NEPA documentation for a vegetation management proposal to prescribe burn sagebrush, aspen, and Douglas-fir encroachment within the Westfork of the Madison and Antelope Basin Areas. See vicinity map. The scope of the proposed action is limited to the burning projects identified in Chapter II. The proposed action is not a general management plan for the area nor is this a programmatic EIS.

This proposal covers approximately 5 years of burning projects in the study areas. These projects are the initial phases of a longer term program of vegetative management that is designed to move toward a desired future condition for the areas. The individual burning projects and alternatives for the 5 year schedule will be presented on a site specific basis as will the discussion of environmental impacts. These individual projects are ready for a decision on whether to proceed.

By considering these projects as part of the longer term strategy, we are able to focus on short and long term objectives, identify the reasonably foreseeable actions for more distant outyears, display potential cumulative effects, and monitor the success of early projects before additional projects are proposed. Any future projects beyond those specifically identified in this analysis will receive complete analysis and disclosure under the National Environmental Policy Act (NEPA).

This Environmental Impact Statement was developed under the implementing regulations of the National Environmental Policy Act (NEPA), Council on Environmental Quality, Title 40, Code of Federal Regulations, Parts 1500 - 1508 (40 CFR 1500 - 1508); and the National Forest Management Act (NFMA), Title 36 Code of Federal Regulations, Part 219 (36 CFR 219). Various discussions and consequences within this document are tiered to the 1986 Beaverhead National Forest Plan and E.I.S., and 1987 Beaverhead National Forest Noxious Weed Control Program E.I.S. These documents are incorporated by reference at the appropriate passages throughout the document. While the Forest Plan and E.I.S. discussed broad issues such as, the determination of suitable timber lands, the availability of various recreation opportunities, actions necessary to provide wildlife habitat, and the management direction for inventoried roadless lands, this document will focus on those specific environmental issues relative to this proposed action.

Organization of Draft Environmental Impact Statement

Chapter II - describes the scoping and public involvement efforts and alternative ways, including the no action alternative, of addressing the significant environmental issues and management concerns related to implementation of this proposal. The measurement indices that will be used to display the effects of alternatives in regard to each issue or management concern are defined. Mitigation measures and monitoring requirements are also defined. The environmental impacts of each alternative are displayed so that a comparison of the impacts can be made.

Chapter III - discusses the environment that is affected by the alternatives. Forest Plan management direction is discussed. Affected resources are described in terms of the area affected, past management actions that affected the resources, and the existing condition of the resources.

Chapter IV - discloses the environmental consequences of implementing the alternatives using the indices of measurement defined in Chapter II and the resource descriptions in Chapter III as the basis for measurement. Direct, indirect, and cumulative effects are depicted and the effectiveness of mitigation measures is addressed. Unavoidable adverse impacts are listed including irreversible and irretrievable commitments of resources.

List of Preparers - contains a listing of the individuals who prepared this document, including names, educational qualifications, and years of direct experience relating to resource management.

Glossary - defines the terms used in the text that may be unfamiliar or specialized. Acronyms are defined after their first usage in the text.

Appendix - contains analytical reports and site specific or supplementary information that adds depth to the discussions in the main chapters.

CHAPTER II

Alternatives

CHAPTER II -- ALTERNATIVES

General Introduction:

Chapter II describes the environmental issues that were developed relative to the proposed action and the alternatives that were formulated in response to the issues. Alternatives considered but not given detailed study are also described. A comparison of the environmental impacts of the alternatives and the mitigation measures are presented. The comparison of effects in this chapter, coupled with the discussion of environmental consequences in Chapter IV of this assessment provides the decision maker with the information needed to make a reasoned choice between alternatives.

A financial analysis was also developed as a projection of the economic efficiency of the alternatives. The analysis displays the present net value of all alternatives. The complete financial analysis is attached to this document as Appendix A.

Alternative Development Process:

Introduction:

Alternatives were designed to sharply define the environmental issues developed through both internal and external scoping while wholly or partially responding to the purpose and need described in Chapter I.

Four alternatives are considered in detail; a no action alternative and three action alternatives. The action alternatives present various schedules and locations of projects as well as different senarios for mitigating their effects. The alternatives represent a reasonable range of actions to accomplish the goals stated in the purpose and need while being responsive to the environmental issues. Alternative 3 is the preferred alternative.

Description of Scoping and Public Involvement:

On January 10,1990 an internal scoping session was held at the Madison Ranger District in Ennis to identify potential issues and concerns with burning sagebrush, Douglas-fir, and aspen in the Westfork Madison and Antelope Basin Areas.

The potential issues and concerns identified were:

Wildlife: Impacts to elk calving areas, antelope and deer fawning areas, and sagegrouse populations.

User Conflict: Disturbance of hunters and outfitters by the smoke if fall burning were conducted and possible visual impacts of burned areas from the Continental Divide National Scenic Trail (CDNST).

Adjoining Ownerships: Potential of damage to private land and property from escaped fire and the need to coordinate our proposals with management activities on private land, BLM, and Targhee National Forest.

Following the internal scoping, the proposal and potential issues were brought to the public to; (1) introduce the proposal to interested and potentially affected individuals, organizations, and other agencies; (2) identify and develop the environmental issues and concerns that would be addressed; and (3) determine the strategies and criteria that would be used to measure impacts.

A news release was prepared and sent to the Forest and District mailing list and individuals who had participated in the Implementation Analysis on the Westfork of the Madison and Antelope Basin Areas.

Open houses were held in Butte on February 5, I990; Ennis on February 6, and Bozeman on February 7.

As a result of the open houses and other contacts, eighty eight written responses were received. Public responses were analyzed by the interdisciplinary team on March 21, 1990. The analysis of responses resulted in the identification of twenty common issues or concerns. From this list, significant environmental issues related to wildlife and landscape diversity were formulated which would require definition by alternatives. Several other concerns that would be addressed through discussions of impacts and mitigation measures were also brought forward. Complete copies of all public responses are incorporated in the project file.

To continue public involvement, a Notice of Intent to Prepare an Environmental Impact Statement was forwarded to the Office of the Federal Register on April 17, 1990. The Notice of Intent appeared in the Federal Register on May 2, 1990. As a result of the Notice, additional written responses were received from the U.S. Fish and Wildlife Service, the Montana Department of Fish, Wildlife and Parks (MDFWP), and the Skyline Sportsmen's Association. The first Skyline response requested additional information on the proposal. The response from the U.S. Fish and Wildlife Service provided information and offered assistance regarding compliance with the Threatened and Endangered Species Act (P.L. 93-205). The response from MDFWP requested additional information regarding the description of existing conditions presented in the Notice of Intent. The Department also offered some of their own findings relative to existing conditions and additional thoughts on the values of sagebrush communities.

In June, 1990, a second response from Skyline Sportsmen's Association was received which addressed each of the purposes identified in the Notice of Intent. Some specific concerns were the level to which cumulative effects would be addressed, the need to re-evaluate and change the in-place grazing systems, loss of wildlife habitat, the need for more study and information relative to the relationships of the wildlife and habitats in the project area, potential impacts to soils, that grazing management is the real issue, and a suggestion that "No Action" would be the best action.

All of the comments received after the filing of the Notice of Intent are incorporated in their entirety in the project file.

During the summer of 1990, representatives from the Madison District and MDFWP reviewed the project area on the ground. Existing conditions were discussed and MDFWP further offered suggestions for modifying the proposal on specific burn units. The suggestions ranged from dropping some units from the proposal, deferring treatment of others, to describing the mosaic and percent burned/unburned which would be desirable in the units that would be treated. Specific documentation of the field reviews and discussions is incorporated in the project file.

A separate field review was scheduled for October 4, 1990 with the expressed purpose of reviewing the project area with the Montana Wildlife Federation, the Skyline Sportman's Association, and the Gallatin Sportsman's Club. These organizations had expressed some particular concerns on the proposed action. There were no representatives from these organizations at the review. A subsequent letter to these organizations expressing the availability of the Forest Service to visit the areas again at the request and convenience of the organization resulted in no additional requests.

In December of 1990, an additional review of the alternatives and wildlife analysis was conducted with MDFWP representatives. The response of the alternatives to the purpose and need as well as the ratios of burned/unburned area within the mosaics was also discussed. No specific adjustments to the proposed action or alternatives were made as a result of this review.

Complete documentation of the internal scoping, public involvement, and analysis of comments is contained in the project file.

Environmental Issues:

The following significant issues were developed from the internal concerns identified by the interdisciplinary team and responses received during public scoping and follow-up contacts and reviews. While public comments were numerous, there was a common thread. The common thread generally revolved around a concern for wildlife and wildlife habitat and diversity.

Issue 1 - Wildlife:

What effect will burning sagebrush, aspen, and Douglas-fir encroachment have on wildlife?

Comments relative to the wildlife issue were mixed. Some participants felt that burning harms wildlife while others felt that wildlife would generally benefit from burning.

The project area provides habitats for a wide range of wildlife species. Big game species of particular concern were elk, mule deer, and antelope. The area also provides yearlong range for moose but there were no specific concerns expressed. There is no critical winter range for the other big game species in the project areas. Small game species of concern are sage, blue and ruffed grouse. Sage grouse are of additional importance as the management indicator species for the health of sagebrush habitats. Some comments also expressed general concerns for impacts on non-game species (small mammals and songbirds).

How will burning affect the habitats of game and non-game species? Can a program of burning be implemented that will improve wildlife habitats in general? How much can be burned, and when will it be burned?

The Montana Department of Fish, Wildlife, and Parks was particularly concerned about the impacts of burning on the cover and security of elk calving areas.

How will the burning impact elk calving?

Some landowners expressed concerns that elk populations were increasing and using more of the forage on private lands needed for domestic livestock.

Will the burning provide additional forage for elk and other big game on National Forest Lands? How Much?

Indices of measure that will be used to display the effects of alternatives relative to this issue are: 1) Habitat suitability index for antelope. 2) Acres burned within elk calving areas. 3) Changes in sage grouse habitat. 4) Changes in habitat diversity for non-game species.

Issue 2 - Landscape Diversity:

What effect will burning have on landscape diversity?

This issue is concerned with how the area looks to the forest user on a broad landscape basis. The landscape considered encompasses approximately 161,170 acres of the West Fork Madison and Antelope Basin areas. The terrain ranges from steep mountains to gently rolling foothills. Vegetative cover ranges from bare rock slopes through dense conifer forests to open sagebrush and grassland communities. The approximate distribution of vegetative communities is presented in more detail in Chapter III.

Concerns relative to landscape diversity were mixed. Some participants felt that diversity should be the result of natural processes such as wildfire and uninterrupted natural succession of vegetative communities. Others felt that the natural diversity had already been compromised due to past activities such as spraying and fire suppression and could be returned to a more natural condition with the introduction of fire back into the system.

How will landscape diversity be affected by the proposal? How will the area look in the future? Can the burning projects be designed to establish or mimic a more natural condition?

Alternatives Considered But Not Given Detailed Study:

Introduction:

The interdisciplinary team considered 4 other alternatives during their deliberation and design of the alternatives presented in detail in subsequent sections of this document. Alternative treatment methods, treatment schedules, and the use of natural fires were considered. The following discussion presents a brief summary of the reasons that these alternatives were not brought forward and given detailed study.

Aerial Spraying with 2-4-D:

The use of chemicals, primarily the herbicide 2-4-D, was examined as one possible way to treat the sagebrush. Aerial spraying with 2-4-D was economically and successfully used on relatively large acreages of sagebrush in 1950's and 60's. However, as public and Forest Service awareness and concern over the broad use of herbicides increased, and more stringent environmental safeguards were adopted, the general desirability and efficiency of using chemicals began to wane from the standpoints of environmental quality and protection, and economics.

In more specific terms, use of chemicals, while resulting in increases in grass production, also resulted in decreases in forb production. Loss of the forbs is contrary to part of the objective of maintaining or enhancing vegetative diversity.

Early large scale spray projects were accomplished with relatively high economic efficiency. Per acre costs ranged from $5 to $10. In terms of this proposal, the relatively small acreages that would be sprayed per year, along with the environmental controls and safeguards that would be implemented, and the increased costs of the aircraft, currently present a different scale of economics. It is estimated that costs today would run in the $40 to $50 per acre range.

A positive feature of aerial spraying is the ability restrict the spraying more specifically to the target stands. Better control of the resulting mosaic of treated/untreated areas would result. There would still be a concern for "drift" of herbicide out of the target area.

The ID team however, did not feel that the better control obtained by aerial spraying outweighed the other factors, and therefore dropped this alternative from detailed study.

Mechanical Treatment:

The mechanical treatment alternative examined such activities as plowing, cabling, or chopping the sagebrush with heavy equipment. Plowing is accomplished by pulling a large rangeland plow behind a dozer. The plow cuts under and turns over the soil and sagebrush. Cabling is accomplished by stringing a length of heavy cable between two dozers and dragging it through the sagebrush. The sage is either broken off or physically torn from the ground. Chopping is accomplished by pulling or pushing a large drum with cutting blades affixed that rolls over and chops the sage up.

There are several concerns associated with these treatment methods. All three mechanical treatments result in relatively large areas of disturbed soils. The loose soils would be more susceptible to movement by wind and water. The windrows, furrows, and hummocks left after the treatment would also be more visually impactive until the vegetation fully recovers and screens the activity. The mechanical treatments also disturb more of the root systems of the grasses and forbs and they must go through a period of recovery before returning to full productive potential. Another concern is economic. From past experience, mechanical treatment of sagebrush will cost $50 to $60 per acre. This is more costly than aerial spraying and 5 to 10 times more costly per acre than burning.

There are some positive features of mechanical treatments. These methods provide the optimum control over the areas treated and the resulting pattern in the treated/untreated mosaic. The overall objectives of the project could be met to a high degree. The timing of mechanical treatment is also very flexible and could be scheduled around the pasture rotations within an allotment. Disruption of the established grazing systems would be minimal.

The ID team however, felt that these positive features did not outweigh the negatives to the degree that this alternative should be given detailed consideration. Care in design of burning prescriptions and ground controls will result in the desired pattern of treated/untreated areas. The personnel who will design and implement the burns also have many years of experience in conducting these kinds of projects. Burning can also be scheduled within the established grazing patterns but does require more coordination. And lastly, the costs of mechanical treatment are very high in comparison to burning.

Accelerated Burning Schedule:

The third alternative examined but not given detailed study was an alternative to accomplish all of the scheduled sagebrush treatment in a five year period. This alternative would result in the greatest amounts of forage produced in a very short time span and would be most responsive to the purpose and need of enhancing forage production for livestock and big game. Within this five year period, nearly all of the acres designated for treatment would be converted to grass and forbs with the exception of the sagebrush remaining as a mosaic within the burned areas. The great majority of the area would be in the early successional stages of sagebrush/grassland development.

The ID team did not give this alternative detailed study because it did not respond to either of the significant issues. This alternative was also not responsive to stated purpose of maintaining a variety of canopy covers in sagebrush/grassland communities. A five year schedule would not provide landscape diversities approaching natural conditions over the long term. Diversity of wildlife habitats would also be weighted very heavily to early successional stages with very little of the mid and late successional stages of sagebrush remaining.

Natural Fire Alternative:

The fourth alternative examined but not given detailed study was to allow natural fire to make the desired changes in the vegetation. This alternative would be responsive to the landscape diversity issue as natural fires would establish over time, a more natural scale of change and diversity. Such a natural change would re-establish the conditions present before the beginnings of fire management and control. It is not expected that a totally natural condition would ever be established due to the density of constructed roads, wheel-track roads and trails that would modify and constrain natural fire behavior.

Research (see Affected Environment, Vegetation, Chapter III) suggests that the natural fire frequency is such that the area would be dominated by open grasslands with sagebrush and conifers existing on the drier, rocky sites where fuels were insufficient to carry the fires. While this may be very desireable over the long term from a forage production standpoint, the ID team was concerned about the effects that unscheduled natural fires would have on grazing systems and facilities on livestock allotments. A natural fire in the wrong place and at the wrong time within an allotment could result in a need to re-align the grazing system. Livestock may not be permitted to use a particular pasture or portion of an allotment recently burned and other pastures would have to be utilized to compensate for the loss. If the other available pastures, for example, had been scheduled for "rest" in this particular year, adequate forage may not be available. Utilizing these pastures out of sequence could also result in the onset of other resource problems such as riparian impacts which the current grazing systems were designed to prevent. If the natural fire were large enough, a worst case may be the deferment of any grazing on the allotment for at least one season. The ramifications of this on the livestock permittee could be very important.

There are many miles of fence, numerous water developments, range cabins, etc, that were constructed to implement the current grazing systems. Natural fires could destroy or severely damage many of these improvements. The initial investment made to construct the facilities, and subsequent investments in maintenance would be lost. The facilities would have to be reconstructed if grazing were to continue. In addition to the direct costs associated with the reconstruction of the facilities, the schedule of accomplishment may take several seasons resulting again in disruption of the grazing systems. The disruption may be minor if only a few facilities are damaged and are quickly reconstructed. The disruption could also be major if several seasons are needed to reconstruct many facilities and the permitted use is either reduced or deferred completely to adequately protect other resource values such as soils and watershed.

The interdisciplinary team was also concerned that large natural fires could have immediate and direct effects on watershed and fisheries values, particularly in areas of steeper slopes and more fragile soils. Removal of vegetation on a large scale in these areas could result in damaging levels of sedimentation. Natural fires can also become very difficult to control, can threaten private property, and become very costly to suppress.

The Beaverhead National Forest Fire Management Action Plan was also reviewed in relation to this alternative.

As per the Action Plan, allowable wildfire suppression strategies include control, contain, and confine. Specific suppression response information can be obtained from the Action Plan. Definitions of suppression strategies are:

Control - To complete the control line around a fire, any spot fires therefrom, and any interior islands to be saved; burn out any unburned area adjacent to the fire side of the control line; and cool down all hot spots that can reasonably be expected to hold under foreseeable conditions.

Contain - To surround a fire, and any spot fires therefrom, with control line, as needed, which can reasonably be expected to check the fire's spread under prevailing and predicted conditions.

Confine - To restrict the fire within determined boundaries established either prior to the fire, during the fire, or in an escaped fire situation analysis.

In this project area, the use of prescribed fire is proposed in Management Areas 1, 14, and 24. Prescribed fire, as defined in the Fire Management Action Plan, is a fire burning under specified conditions, which will accomplish certain planned objectives.

The use of natural occurring fire must be considered, however the opportunities are fairly limited. The Fire Management Action Plan has established limits on the number of allowable annual burn acres for each Management Area. Limiting factors for the use of natural fire within these areas include any ignition adjacent to area boundaries where escape to other Management Areas would be likely, other larger fires within the area which may escape, and the relatively small total acreage that can be burned in each Management Area. The annual allowable acreage burned by wildfire on a forest-wide basis is presented in the following table.

Table II-1. Annual Allowable Burned Acres by Wildfire.

Management Area	Allowable Acres
1	1500
14	50
24	900

While natural fires may provide the most natural landscape over time, and ultimately could result in the greatest quantities of forage over the long term, the ID team felt that the potential magnitude of natural fires, damage to other resources, the threat to private property, suppression costs, the loss of facilities, the potential for significant disruption of current grazing systems, and the potential economic impact on both the agency and the livestock permittee did not warrant giving this alternative detailed study. The Beaverhead Fire Management Action Plan places severe restrictions on the total acres allowed to be burned by wildfire. In general, wildfires will be controlled. In summary, natural fires are not the appropriate means to achieve the management objectives for these areas.

Alternatives Considered In Detail:

Features Common to all Action Alternatives:

Introduction:

In this section, the specific features and mitigation measures found in all action alternatives are presented. The features and mitigation measure are responsive to elements of the purpose and need, environmental issues, and other public comments or concerns.

Specific Features and Mitigation Measures:

Wildlife:

Wet meadows provide important feeding sites for sage grouse and adjacent sagebrush is important as cover. To maintain the integrity of the wet meadow feeding sites and adjacent cover, a 150 foot buffer of unburned sagebrush will be provided around wet meadows.

No currently active or historical sage grouse breeding sites (leks) have been inventoried within the burn areas. However, if such a site is discovered, a buffer of 1.5 miles of unburned area will be retained around the lek to secure its integrity.

Ferruginous hawk, a sensitive species, are suspected to nest in the upper reaches of the West Fork Madison river in the vicinity of Patchtop Mountain, Landon Ridge, and Snowshoe Pass. No nest sites have as yet been discovered within or immediately adjacent to burn units. The hawk is very sensitive to disturbance during egg laying and incubation. Even minor disturbance could cause abandonment of the nests. To mitigate this impact, the Landon, Patchtop, and Metzel units and areas around the units will be surveyed for nest sites prior to burning. If nests are discovered in or within 300 yards of a unit, the unit will not be burned in the spring. In addition, the specific nest site will be buffered so the site itself is not destroyed by fire.

Cottontails and jackrabbits are important prey species for Ferruginous hawk. To maintain suitable habitat for the prey species it is important to not exceed a 40-60% mosaic within the burn units in the upper reaches of the West Fork Madison River. To mitigate this impact, burn units and prescripations will be designed to achieve a 40-60% burned/unburned mosaic.

There are Trumpeter Swan nesting sites on Conklin and Elk Lakes. Burn units approach to within 300 yards of the nest sites. Burning these units in late March or in April when the swans are either preparing the nest or incubating could cause abandonment of the nest. To mitigate this potential impact, the Elk Lake Unit #5, Conklin-Pothole Unit #4, and Conklin/Sheepfield Unit #3 will be burned in the fall.

A Bald Eagle nest site is located on the east side of Elk Lake near the north end of the lake. Smoke from a spring burn of Elk Lake Unit #5 could drift into the nest area and cause abandonment of the nest during incubation. To mitigate this impact, Elk Lake Unit #5 will be burned in the fall.

More specific discussions on the effects of the proposal on threatened, endangered, and sensitive species are presented in the Biological Evaluation, Appendix B.

Diversity:

One purpose of the project is to establish and maintain a diversity of canopy covers in the sagebrush communities. On a large scale, diversity is discussed in relation to the landscape diversity issue. On a more site specific basis, an additional objective is to establish diversity within the individual burn units. To accomplish the more site specific objective, all burn units and burning prescriptions will be designed to achieve a 40-60% (average 50%) burned/unburned mosaic within the individual units.

Livestock Management:

All proposals to burn are in management areas that are available and suitable for livestock grazing. Field reconnaisance confirmed on a more site specific basis that the specific burn units are located on lands suitable for grazing. Summaries of these reviews are found in Chapter III and in the project file.

The public expressed concerns that livestock numbers would be increased as forage increased and there would be no benefit to big game. One of the purposes of the project was to improve forage production for livestock and big game. To accomplish this objective, none of the action alternatives provide for or assume an increase in livestock numbers to utilize forage increases. The current numbers of livestock will not change, Forest Plan range utilization standards will continue to be met, and there will be a net increase in forage available for big game.

Several public comments expressed a need to redesign the grazing systems to prevent overutilization of forage increases and protect other resource values. All grazing allotments are currently being managed under rest-rotation or deferred grazing systems. The success of these systems is demonstrated in the overall good to excellent condition of the ranges. To avoid disruption of these grazing systems and the need to re-design the system of rest and rotation among pastures, all burning projects will be sequenced within the existing systems. This is generally accomplished by scheduling the burns in such a way that treated areas will receive a period of recovery before being grazed.

Watershed:

All action alternatives will have burns in close proximity to streams. While the potential for soil movement and impact to streams is minimal, the following mitigation measure will be implemented in all alternatives.

On slopes of 0-15%, a 50' buffer of unburned area will be maintained along streams. On slopes greater than 15%, the buffer will be increased to 100' from the stream. These strips of unburned vegetation will provide adequate filtering of any erosion that does occur in the burn units.

Monitoring:

Sagebrush Mosaic:

To determine if prescribed fire prescriptions are maintaining the planned mosaic of burned and unburned sagebrush within each burning unit, post burn monitoring of the fire patterns would be required.

The purpose of the post burn monitoring would be the detailed mapping of the burned and unburned sagebrush within a unit. This monitoring will validate current burning prescriptions and aid in adjusting future prescriptions.

The method that will be utilized in the monitoring efforts will be a general walk through exam and mapping of burned and unburned sagebrush plants. Post burn photographs will be used as an add in refining the map. Monitoring activities will be completed for every unit directly after the burn. Work will be accomplished by the Ennis Ranger District Range Conservationist.

Sagebrush Reestablishment:

To determine if sagebrush is reestablishing itself in the burn areas, sagebrush monitoring will be required within burn units after they are treated.

The purpose of the post burn sagebrush monitoring will be to document the response of the sagebrush plants and community to fire. Monitoring will center on the establishment of sagebrush seedlings and their survival over the years.
The method that will be utilized in the monitoring will be a vegetation transect to measure the density of sagebrush plants by age class along with total sagebrush canopy cover. Monitoring will be completed on selected burn units located throughout the project area. Sites will be selected to represent the variation within the sagebrush/grass vegetation. At least one site will be established each year. Transects will be established one year post burn and reread every five years there after. Work will be accomplished by the Ennis Ranger District Range Conservationist.

Aspen:

To determine how well the fire treatment stimulates aspen regeneration post burn aspen monitoring will be required.

The purpose of the aspen monitoring will be to measure the density of new aspen suckers sprouting after the burn and monitor their utilization by livestock and big game.

The method that will be utilized in the monitoring will be a general walk through survey which include quick plots to measure sucker numbers and livestock/big game utilization. Monitoring will be completed in selected aspen stands within burn units. Stands will be selected to represent the variation within the aspen. Stands will be measured the first fall after the burn and remeasured yearly for three years. Work will be coordinated by the Ennis Ranger District Range Conservationist or Wildlife Biologist.

Sage Grouse:

The impacts of burning on sage grouse habitat and populations is a major public concern. Grouse populations have experienced fluctuations in the past. For several years, the Madison Ranger District has maintained a program of reporting all sage grouse observations on the project area. The purpose of the program is to monitor the distribution and populations of grouse. Sage grouse observations and historical records to the early 1950's indicate a very low population.

This ongoing district program will be continued into the forseeable future. The purpose is to continue gathering the basic population and distribution information and determine if there are any measureable reactions of the grouse to the burning activities. This monitoring effort will be coordinated by the District Wildlife Biologist.

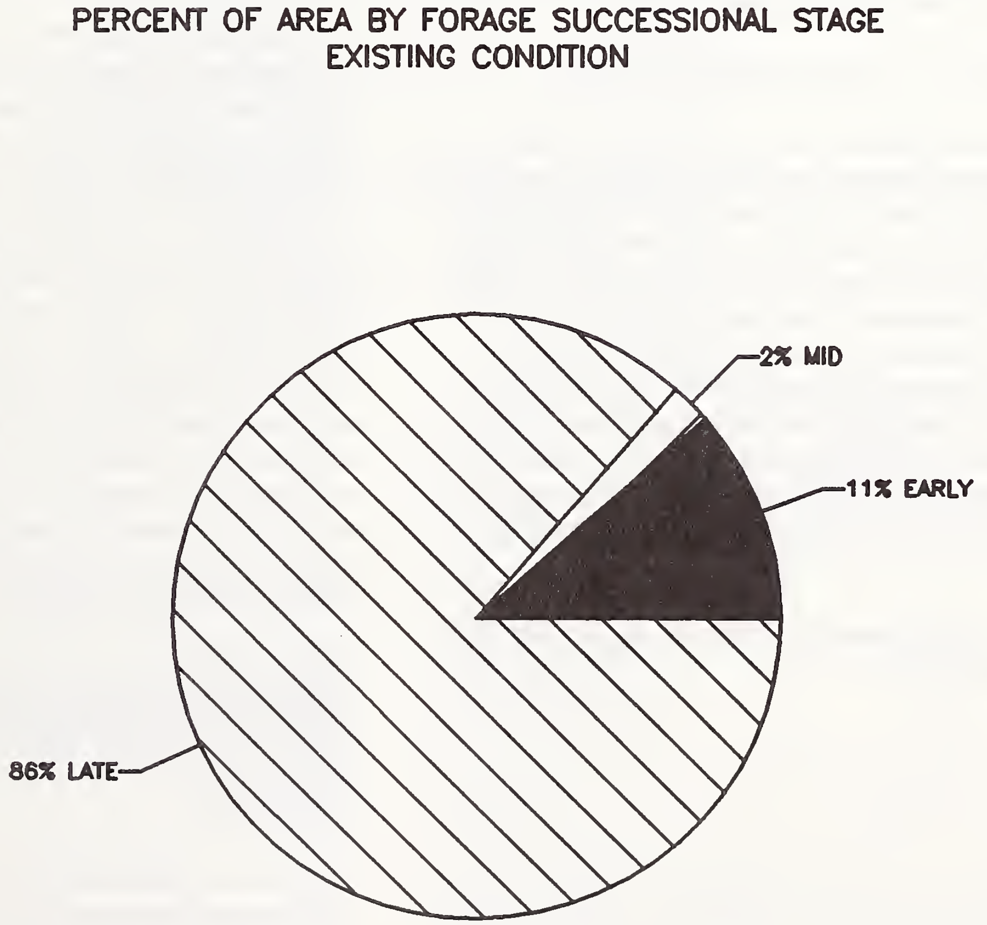
Elk:

The impacts that burning would have on calving elk is a major concern. For the past six years, MDFWP has conducted a radio location study of calving elk in the Antelope Basin and West Fork Madison areas. Continuation of this study is an essential monitoring element.

One purpose of the study would be to monitor the reaction of calving elk to the burning projects. Reactions would be measured for short and long terms. Short term measurements would include any immediate reactions of calving elk during the actual burning projects and for a period of 1-2 years after the burn. Long term measurements would include monitoring any trends or large scale shifts in the general elk movement and calving patterns. Long term monitoring would continue for at least a 10 year period.

Coordination with the MDFWP on this monitoring effort will be accomplished by the District Wildlife Biologist.

Figure II-1. Successional Stages of Sagebrush Currently Existing in the Project Area.



Alternative Descriptions:

A description of the No Action and the three alternatives considered in detail is presented below. As a part of each discussion, a graph is presented which depicts the distribution of successional stages that would be acheived and maintained within a given alternative.

Alternative 1 - No Action:

The No Action alternative would initiate no burning activities in the project area. All of the sagebrush would eventually progress into late successional stages. The alternative is the primary reference point for comparison of the diversities that would result from the action alternatives. The diversities resulting from action alternatives can be compared against both the existing condition shown in figure II-1 or against the ultimate condition of 100% of the area in late successional stages.

Alternative 2 - 10 Year Burning Cycle:

Alternative 2 initiates the conversion of later successional stages and dense canopy covers by burning at a rate of approximately 3024 acres per year over the 10 year cycle. The diversity that is established through the first 10 year cycle would then be maintained over subsequent decades by additional burning at approximately the same rate. The additional burning would convert the areas not treated in the first decade and which continued to develop successionally. The schedule and areas that would be burned are shown on the Alternative 2 map and are summarized as follows:

Table II-2. Schedule of Burn Units and Acres - Alternative 2.

Schedule of Burn*	Number of Units	Acres
Spring 1991	12	1459
Fall 91/Spring 92	18	2741
Fall 92/Spring 93	18	2837
Fall 93/Spring 94	18	2541
Fall 94/Spring 95	16	2873
Fall 95/Spring 96	11	2543
Totals	93	14,994**

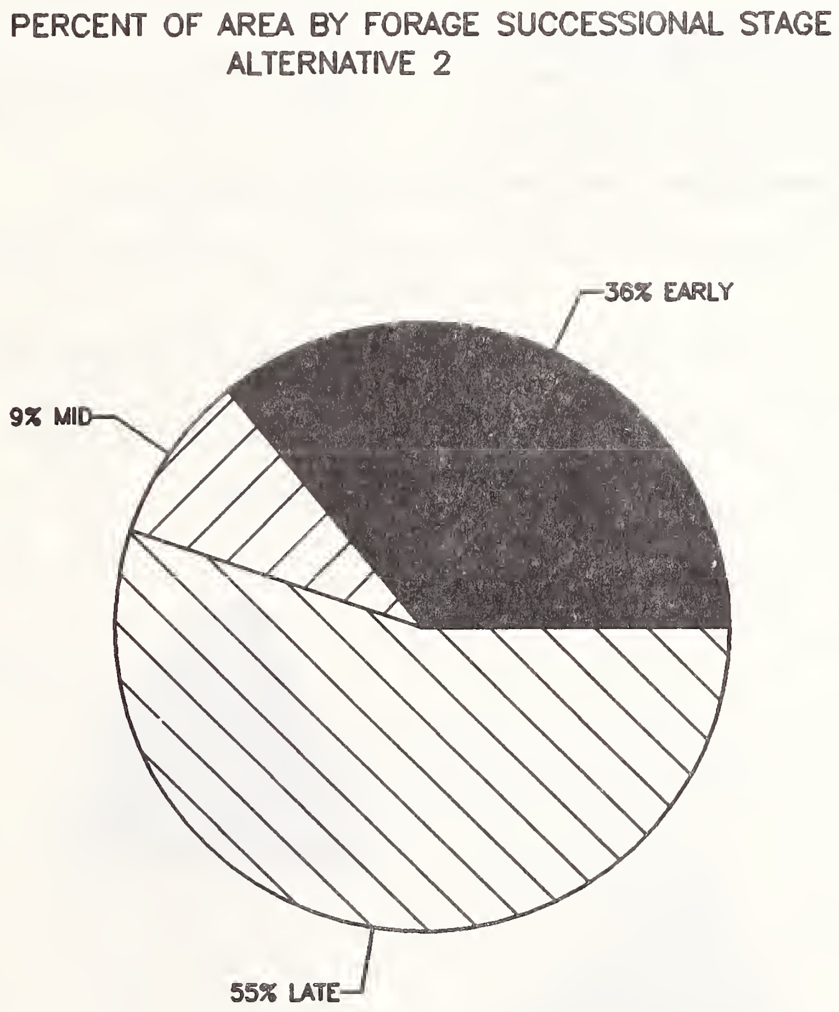
* The reason that both Fall and Spring burns are shown in this and subsequent alternative descriptions is due to variability of weather and when suitable burning conditions may be present. Scheduling in this way also provides the flexibility needed to accomplish individual projects within the mitigation requirements discussed previously.

** In this alternative, the 14,994 acres scheduled for treatment in the first five to five and a half years does not average out to the 3024 acres per year that is proposed in the alternative. The reason is that the initiation of this burning cycle is the most difficult to schedule within the pasture rotations on the grazing allotments. To accomplish the full 3024 acres per year would require disruption of the pasture rotation schedules to stay within the mitigation requirements discussed previously. This more aggressive burning cycle must also wait until later in the cycle for the units that were sprayed to be ready for treatment. As these units are picked up toward the end of the 10 year period, the annual acreage treated will be greater than the first half of the cycle. The net result will be the 3024 average described in the alternative.

This alternative emphasizes early successional stages and is the most responsive of the action alternatives to the purpose and need discussing improvement of forage production for livestock and wildlife.

This alternative would result in a landscape mosaic which would favor early successional stages with scattered stands of late stages that are allowed to progress naturally. There would be very little of the mid successional stages in the mosaic.

Figure II-2. Successional Stages of Sagebrush Resulting from Alternative 2.



Alternative 3 - 20 Year Burning Cycle (Preferred Alternative):

Alternative 3 initiates the conversion of later successional stages and densest canopy covers by burning at a rate of approximately 1512 acres per year over a 20 year cycle. The diversity that is established through the first 20 year cycle would then be maintained by a regular program of burning to treat the stands that have now progressed into later successional stages. The schedule and areas that would be burned are shown on the Alternative 3 map and are summarized as follows:

Table II-3. Schedule of Burn Units and Acres - Alternative 3.

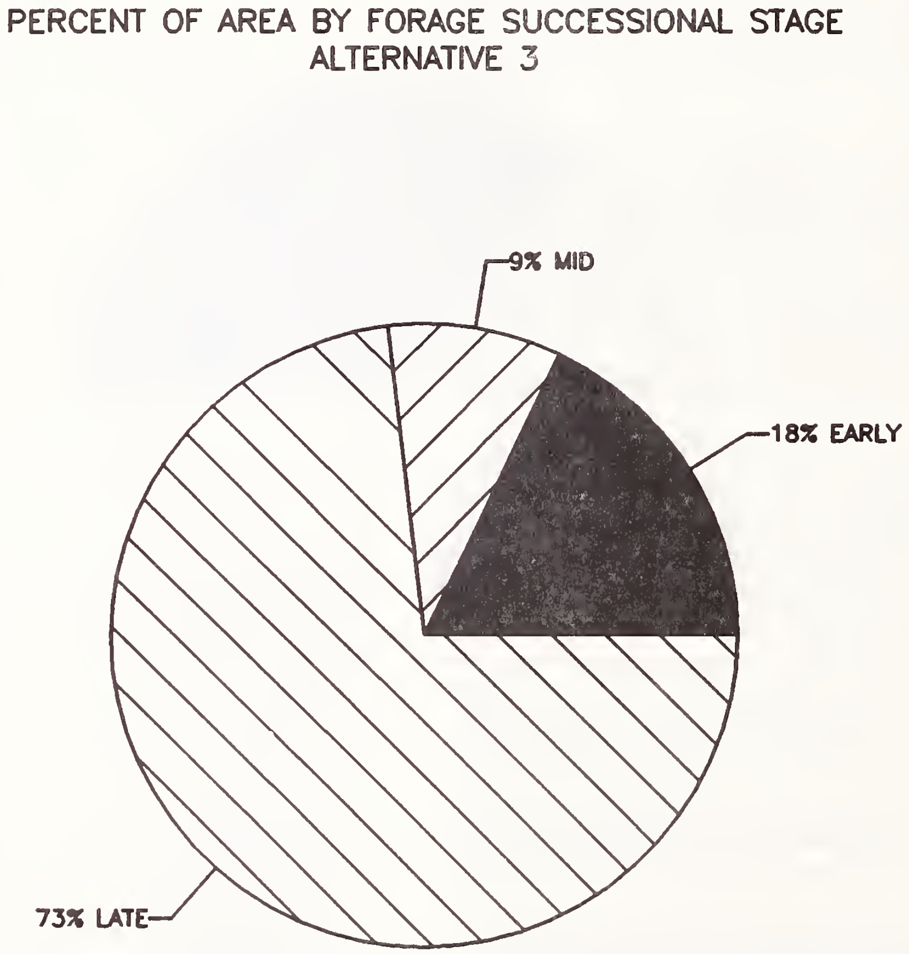
Schedule of Burn	Number of Units	Acres
Spring 1991	7	947
Fall 91/Spring 92	11	1505
Fall 92/Spring 93	9	1513
Fall 93/Spring 94	10	1492
Fall 94/Spring 95	10	1540
Fall 95/Spring 96	9	1315
Totals	56	8312

This alternative is designed to be responsive to both elements of the purpose and need. Forage production is improved and the diversity of canopy covers and wildlife habitats that would be developed and maintained over time would cover the full range of successional stages with a favoring of the later stages.

Alternative 3 defines the Landscape Diversity issue by establishing and maintaining a broader spectrum of successional stages within the sagebrush communities. A variety of wildlife habitats will be maintained.

Figure II-3 displays an approximation of the diversity that would result from Alternative 3.

Figure II-3. Successional Stages of Sagebrush Resulting from Alternative 3.



Alternative 4 - 30 Year Burning Cycle:

Alternative 4 initiates the conversion of later successional stages and densest canopy covers by burning at a rate of approximately 1008 acres per year over the 30 year cycle. The diversity that is established through the first cycle would be maintained by a regular program of burning to treat the stands that have now progressd into later successional stages. The schedule and areas that would be burned are shown on the Alternative 4 map and are summarized as follows:

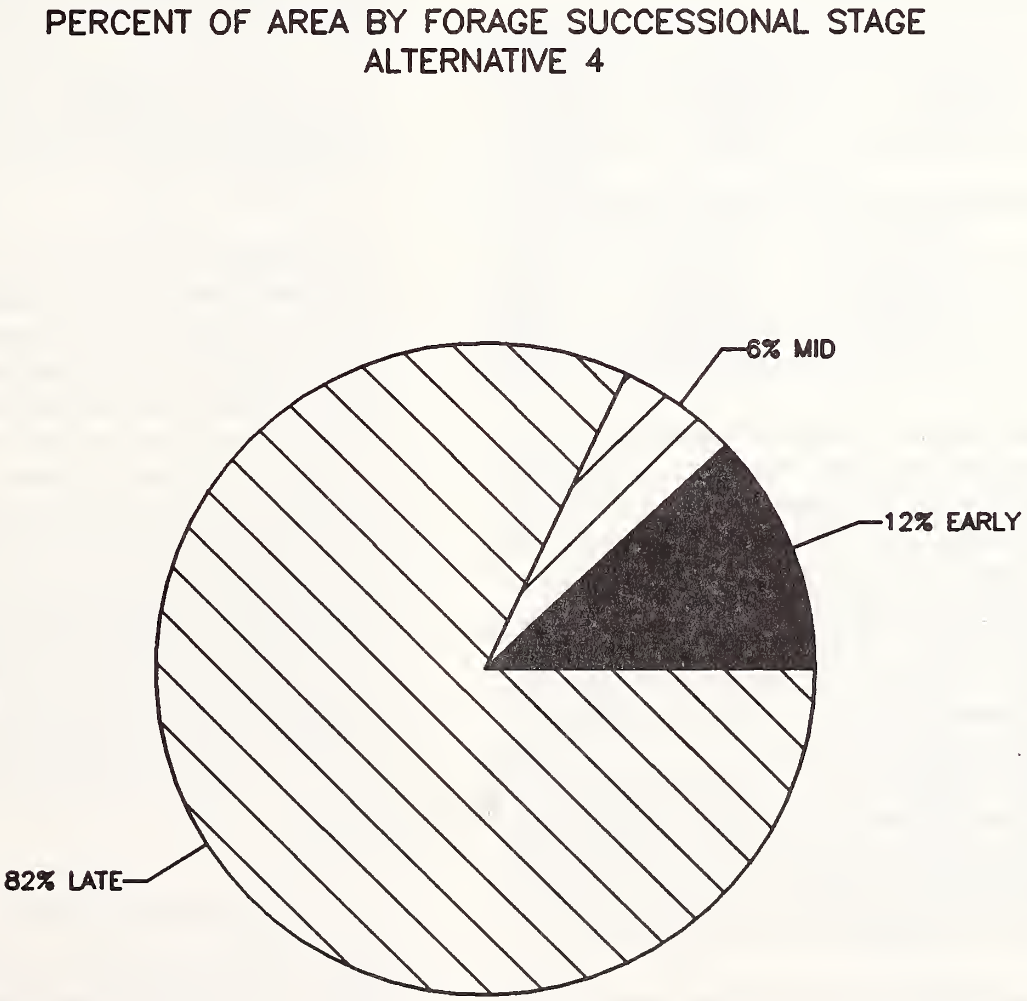
Table II-4. Schedule of Burn Units and Acres - Alternative 4.

Schedule of Burn	Number of Units	Acres
Spring 1991	5	725
Fall 91/Spring 92	7	1110
Fall 92/Spring 93	3	1111
Fall 93/Spring 94	8	1022
Fall 94/Spring 95	7	970
Fall 95/Spring 96	11	828
Total Units	41	5766

This alternative is responsive to both elements of the purpose and need. Forage production will be maintained, and a full range of successional stages, hence diversity will be maintained. Late successional stages are more heavily favored in this alternative.

Figure II-4 displays an approximation of the diversity that would result from Alternative 4.

Figure II-4. Successional Stages of Sagebrush Resulting from Alternative 4.



Comparison of Alternatives:

Through many of the following discussions, references will be made to the various successional stages and canopy covers that will result from the alternatives. The reader is referenced to the figures (pie charts) presented earlier in this chapter, and to the figures presented in chapter 4 as an assist in understanding the following comparisons.

Wildlife:

The following discussion will offer a comparison on the alternatives as they relate to the purpose and need of the proposal and to the major elements of the wildlife issue.

One purpose was to maintain forage for current permitted livestock and meet forage needs of big game. Alternative 1, No Action is the least responsive to this purpose while Alternative 2 is the most responsive. Forage production figures presented in the following table are a summary of the detailed analysis presented in Chapter 4.

Table II-5. AUM's of Forage Produced.

Alt	Livestock AUMs Produced	Permitted Livestock AUMs	Change in AUMs Available for Big Game
1	16,477	20,131	- 3,654
2	24,716	20,131	+ 4,585
3	21,626	20,131	+ 1,495
4	19,909	20,131	- 222

Alternative 1 would provide the least amount of forage over the long term. The net result would be a need to reduce livestock AUM's to maintain the current levels of forage for big game. Alternative 2 would provide enough forage over time to maintain the current permitted AUM's of livestock. There would be an additional amount of forage available for big game. Alternative 3 would also maintain current livestock AUM's with additional forage available for big game. Alternative 4 comes very close to maintaining the existing condition. The potential negative 222 AUM's resulting from this alternative are +- 1% of current AUM's and are not considered significant enough to require any specific management actions to rectify.

Another part of the purpose of the proposal was to maintain a diversity in the successional stages and canopy covers of sagebrush and to maintain diversity in successional stages of aspen stands. The following table is a consolidation of the analysis and graphics presented earlier in this chapter and in Chapter 4.

Table II-6. Percent of the Sagebrush Communities by Successional Stage.

Alt	Early	Mid	Late
1	0	0	100
2	36	9	55
3	18	9	73
4	12	6	82

Alternatives 1 and 4 are the least responsive to the purpose. While the full range of successional stages is represented, the balance is weighted most heavily toward advanced age classes and canopy covers. Alternatives 2 and 3 represent a more balanced distribution of successional stages and canopy covers with Alternative 2 providing the most even balance.

Aspen stands will be treated at approximately the same rate in proportion to sagebrush acres in all action alternatives. The one real comparison that can be made is the gradual loss of aspen that will result from the no action alternative. As noted in chapters 3 and 4, aspen stands will be replaced by conifer or sagebrush/grass communities. Their contribution to the overall diversity of habitats will be lost. Species such as ruffed grouse which depend heavily on aspen and successional diversity within aspen would be adversely affected. Since ruffed grouse are so closely tied to aspen communities, it is suspected that reductions in the habitat would result in reductions of grouse populations within the project area.

Antelope:

Concern about the effects of the proposal on antelope habitat was an important element of the wildlife issue. The antelope habitat suitability index was used to measure the effects relative to the concern. The following table presents the changes that will occur to antelope habitat.

Table II-7. Changes In Antelope Habitat Suitability.

Alt	Existing Condition (1.0 Possible)	Projected Future
1	.65	.52
2	.65	.82
3	.65	.84
4	.65	.78

Alternative 1 would result on an overall decrease in antelope habitat quality. Alternatives 2,3, and 4 would all improve the habitat quality. With only six points of difference between the highest and lowest rating, one can't speculate that any particular action alternative is significantly better than another.

From a more general perspective, it can be surmised that the action alternatives will positively benefit antelope and as a minimum, maintain current populations. Alternative 1, No Action does result in decreased habitat quality but whether the populations will adversely suffer is difficult to predict. It is not known whether the existing habitat is occupied to capacity or whether other factors such as hunting are keeping populations below habitat capacity.

Mule deer:

The following effects are a summary of the analysis displayed in Chapters 3 and 4. The biological needs of the deer herd on summer range will generally be met in all alternatives. Fawning cover and forage (browse and forbs) are adequate and it is suspected would remain so even if no burning would take place. The deer will respond favorably to the flush of forage, particularly forbs, that would be present in the recently burned areas. However, no changes in populations are expected to result from the summer range habitat alterations.

Mule deer effectively utilize sagebrush for hiding and bedding cover. As more openings are created, vulnerability to hunting is increased. Alternative 1 would retain the most sagebrush in late successional stages and provide the best cover for deer. Vulnerability would be the least affected in this alternative. Alternative 2, with the greatest acreage of grassy openings created and maintained over time, would result in the greatest increase in vulnerability to hunting. Alternatives 3 and 4 would be very similar to Alternative 1 in relation to vulnerability.

It is therefore suspected that Alternatives 1, 3, and 4 would have no measureable effect on mule deer populations or structure of the herds. While difficult to quantify, it is suspected that Alternative 2 could have an adverse effect on the populations and structure of the deer herds in the project area.

Elk:

The impacts of the proposal on elk habitat, primarily calving habitat, was a major element of the wildlife issue. Concentration areas of calving elk were derived from information provided by MDFWP. This information served as the basis for analysis of effects on elk calving.

The primary index of measure relative to this issue was the number of acres that would be burned within the calving areas. The following table displays that comparison.

Table II-8. Acres Burned Within Elk Calving Areas.

Year	Alt 1	Alt 2	Alt 3	Alt 4
Spring 1991	0	82	82	0
Fall 91/Spring 92	0	833	553	553
Fall 92/Spring 93	0	1196	677	80
Fall 93/Spring 94	0	165	165	165
Fall 94/Spring 95	0	267	135	349
Fall 95/Spring 96	0	70	350	70
Total	0	2613	1962	1217

From a numerical standpoint, alternative 1 would have no impact on elk calving areas as no sagebrush cover would be removed. Alternative 2 would remove the greatest amount of sagebrush cover and impact elk calving areas the most. Alternatives 3 and 4 would have progressively lesser impacts to calving areas. These numbers however, have little meaning without application of some qualitative analysis. Details of such analysis are presented in chapter 4 but are summarized here.

Available research neither confirms nor refutes that elk need sagebrush for calving. It has been observed that calving areas in this project area are in or near the spring green-up zone which does contain significant stands of sagebrush. It has also been observed that elk populations continued to increase in the 1970's and 1980's despite the extensive spraying projects when very large acreages of sagebrush were removed in a very short time frame. It has also been observed, that given a choice, elk may prefer to calve in sagebrush.

In terms of sagebrush recovery, the burning cycle established in alternative 4 rates best as it provides the greatest amount of time between burns and allows the sagebrush to obtain heights and densities that provide cover. The burning cycle established in alternative 2 is the least desireable from a sagebrush recovery standpoint as more acres are kept in early successional stages.

Given the observations and magnitude of the effects discussed however, it is suspected that none of the action alternatives will result in any measureable adverse impacts to elk calving success, elk populations, or herd structures.

Sage Grouse:

The impact of burning on sage grouse habitat and populations is a major element of the wildlife issue and the index of measure is to describe the changes that will occur in the habitat. The following comparisons are qualitative in nature as no meaningful quantitative measurements could be designed.

None of the action alternatives will impact either of the most critical habitat components, winter range, and breeding areas (leks). It is suspected the grouse in the study area winter in Idaho. There are no leks currently inventoried in the study area.

Grouse populations have fluctuated widely in the past, though they have never been high. Current populations are low and appear to be stagnant. The current distribution and condition of the sagebrush on National Forest lands does not appear to be a limiting factor for grouse. See Chapter 3 Existing Conditions.

The relative effects of the alternatives on sage grouse habitat are summarized below. The detailed analysis and literature researched are noted in Chapter 4.

Alternative 1 allows the natural succession of sagebrush habitats. As the sagebrush reaches maturity, and if canopy covers close to 30-40%, sage grouse use could be discouraged. Given the low current populations of grouse, this effect is not expected to be significant as there will be adequate areas in the successional stages and canopy covers that provide good grouse habitat. As the canopy covers close, the production of forbs, an important grouse food, will decrease. As canopy covers close and grass production declines, livestock may be forced into heavier utilization of riparian areas. Riparian areas are very important grouse feeding sites for the insects and forbs they produce. A decline in the quality of riparian areas results in a parallel decline in their value as feeding sites for grouse. At the present, the condition of riparian areas and grouse food production are not limiting.

Ultimately, the result of alternative 1 would be a general decline in the overall quality of grouse habitat. It is not expected that this decline would be severe enough to retard grouse recovery in the area.

Alternative 2 has the greatest potential to adversely impact sage grouse habitat. Under this alternative, with a burning cycle of 10 years, large areas of sagebrush will be maintained in early successional stages. The early successional stages will be marginally useful for cover or nesting.

Alternative 3 offers the best potential to improve sage grouse habitat through providing a good mix and distribution of successional stages of sagebrush. Sage grouse habitat needs would be provided to the greatest degree over the long term in this alternative.

Alternative 4 offers some potential to improve sage grouse habitat but to a lesser degree than alternative 3. The primary difference is in the greater area of late successional stages with heavier canopy covers that are maintained in this alternative.

All of the action alternatives could reduce the quality of riparian feeding sites by burning the adjacent sagebrush cover. Mitigation measures discussed previously will compensate for this potential impact in all alternatives.

In general, it is suspected that none of the impacts are of such significance that the habitat quality will be severely affected. It is not expected that the alternatives will measureably deter the recovery of sage grouse in the project area nor will the alternatives measureably impact the current populations of sage grouse in the area.

The following table offers a summation of the previous discussions.

Table II-9. Expected Changes to Sage Grouse Habitats and Populations.

Habitat Element	Alt 1	Alt 2	Alt 3	Alt 4
Forb Production	(-)	(+)	(+)	(+)
Riparian Feeding Areas	(-)	(0)	(0)	(0)
General Habitat Quality	(-)	(-)	(+)	(+)
Short Term Impacts on Population	(0)	(0)	(0)	(0)
Long Term Impacts on Recovery	(0)	(0)	(0)	(0)

(-) = a general decline or negative trend.
(+) = a general increase or positive trend.
(0) = a neutral response, essentially no noticeable or measureable change.

Non-game and Small Game Habitats:

Concern about the effects of the proposal on non-game and small game habitats was a major element of the wildlife issue. An index of measure was defined which would measure the changes in habitat diversity and what the changes would mean in terms of small game and non-game species diversity.

Aspen is an important element of habitat diversity. Ruffed grouse are very dependent on aspen. Species of vireos and sapsuckers also have direct dependencies on aspen for feeding and nesting. Other species such as western bluebird are secondary cavity nesters in aspen.

Alternative 1 is the least responsive of the alternatives in maintaining diversity in the aspen components. No aspen would be treated and the stands would continue to deteriorate and eventually die out. Populations of ruffed grouse, vireos, and sapsuckers could be expected to decline as the stands are lost. Cavity nesting opportunities for bluebirds would eventually be lost as available cavity nesting trees fall and no live aspen are available as replacements.

Alternatives 2 and 3 are very similar in the rate of aspen treatment. These alternatives are the most responsive to the purpose and need by maintaining a diversity of successional stages in aspen and in maintaining aspen as a key habitat element well into the future. At a minimum, it is suspected that these alternatives will provide the diversity and distribution of aspen necessary to maintain current populations of dependent and associated species.

Alternative 4, with a much slower rate of treatment will not get to some of the decadent stands in time and they may be lost. The rate of loss is not expected to be significant and any effects on dependent and associated species is expected to be minor.

Sagebrush communities provide habitats for a wide range of non-game species. For purposes of this analysis, some representative species of song birds were selected to represent the change in species diversity that could occur in conjunction with changes in habitat diversities.

The changes displayed in the following table are relative changes and are intended to portray the trends that could occur as the successional stages of sagebrush vary between the alternatives.

Table II-10. Relative Reaction of Selected Species to Habitat Changes.

Species	Alt 1	Alt 2	Alt 3	Alt 4
Brewer's Sparrow	(++)	(--)	(+)	(+)
Sage Sparrow	(0)	(--)	(+)	(+)
Grn-tailed Towhee	(++)	(--)	(+)	(+)
Vesper Sparrow	(++)	(0)	(0)	(0)
Longspurs	(--)	(++)	(0)	(-)
Western Meadowlark	(--)	(+)	(0)	(-)
Horned Lark	(--)	(++)	(0)	(-)
Mourning Dove	(--)	(+)	(0)	(-)
Sage Thrasher	(+)	(-)	(+)	(++)

(+) = A potential increase in population from the existing condition.
(-) = A potential decrease in population from the existing condition.
(0) = No change or essentially maintaining the existing populations.

It is not expected that any of the alternatives will completely eliminate the habitat of any sagebrush associated or dependent species from the project area. The overall mosaic will continue to provide all habitat elements for the species currently present in the study area but there would be some expected trends or shifts in populations of individual species.

As shown in the table, alternatives 1 and 4 would provide more of the late succession habitats which would favor the species needing closed canopies and generally heavier stands of sagebrush. Alternative 2, with the shortest burning cycle would result in more open grassland acres over time and would favor those species needing the more open habitats. Alternative 3 would essentially maintain the current condition for most species. Alternative 3 would provide the best blend of open feeding areas and adjacent sagebrush cover over time. Alternative 4 does not provide as balanced a grass/sage ratio as alternative 3. Alternative 4 is probably closest to reflecting what the conditions within the burn units would be if natural fire were allowed to burn. Alternative 4 is the best representation of what natural vegetative and wildlife diversity would be.

Landscape Diversity:

The effect of the alternatives on landscape diversity is a significant issue. As discussed here and in chapters 3 and 4, landscape diversity refers primarily to how the area will look over time. In this context, landscape diversity is a visual quality question. Indices of measure for landscape diversity use many of the same features as the indices for wildlife, i.e. successional stages of sagebrush and canopy covers. Analysis and discussions relative to these two issues are therefore closely related.

Table III-1 in Chapter 3 displays the existing condition of the study area for all vegetation and other landscape components. Of the components described in the table, sagebrush/grass, conifer, and aspen would be affected by the proposal.

Through analysis of the action alternatives, it is apparent that the rate of aspen and Douglas-fir treatment would result in essentially no noticeable change in the landscape over time. Aspen stands comprise only 3% of the study area and only 2% of the stands would be treated annually. The major contribution of the action alternatives would be to maintain aspen as a part of the landscape for it's scenic and habitat values.

There are 95,664 acres of conifers, primarily Douglas-fir in the study area. Treatment of 80 acres of encroachment (.08% of conifer forest) per year along the edges of the forested areas will be virtually un-noticeable from a landscape perspective.

Alternative 1, no action, would have a much different effect, particularly in relation to aspen. As aspen stands continued to die out, they would eventually disappear or be a much smaller component of the landscape. The seasonal color provided by aspen, and the pleasant contrast of patterns and form provided by the aspen in a landscape generally dominated by low level sagebrush and grass would be lost. In the coniferous forest component of the landscape, the effects of no action would be much less evident. The rate of conifer encroachment into the sagebrush is a relatively constant but slow process. Given the large acreage of conifers present, and the distribution of the stands throughout the study area, it is suspected that the gradual incursion of the conifers into the sagebrush would not be noticed.

The effects of the alternativess on the sagebrush/ grass component of the landscape are much more measureable. Table III-2 displays the existing condition of the sagebrush/grassland in terms of canopy cover densities. Chapter 4 displays the changes in canopy covers that will occur in each alternative. The following table is a summary of those discussions and offers a quick comparison of those changes.

Table II-11. Acres in Canopy Cover Classes By Alternatives.

Class	Existing	Alt 1	Alt 2	Alt 3	Alt 4
0-5%	8251	0	9072	6048	4536
6-10%	8821	0	9072	6048	4536
11-15%	14557	5271	3003	9051	7539
16-20%	8378	26355	15015	15015	19551
21+%	2161	10542	6006	6006	6006

As shown in the table and discussed in detail in chapter 4, alternative 1 will provide the least landscape diversity over time. Sagebrush stands will continue to progress successionally. Sagebrush canopies will eventually close, grassy openings will be lost. The landscape would generally be dominated by sagebrush.

Alternative 2, with sagebrush burning occuring at the fastest rate over time would result in a landscape dominated by a more open grassy appearance. There would be scattered patches of sage in the burn units that the fire did not hit. Alternative 3 would provide the most even mix of canopy covers and diversity of all the action alternatives. No single canopy cover class would appear to dominate the landscape. The landscape would appear as a mixing of open grassy areas interspersed with moderately dense to dense stands of sagebrush.

Alternative 4, with the slowest rate of burning would result in a landscape similar to alternative 3 but with a trend toward dominance by the older and more dense stands. There will still be grassy openings visible but they will be fewer in number and more widely distributed in the project area.

In summary, all action alternatives provide and maintain a broad range of successional stages and canopy cover densities within the landscape. No single successional stage or canopy cover class will totally dominate to the exclusion of others. Alternative 1 would result in a landscape dominated by sagebrush and is probably the least desireable from a diversity perspective. A landscape containing a blend of irregularly shaped grassy openings and sagebrush stands distributed or appearing as a random mosaic would be more pleasing to the eye than one dominated by sagebrush. The question of which action alternative may be best from a landscape diversity perspective however, is difficult to quantify. From a subjective standpoint, alternative 3 would provide the best balance of sagebrush and grassy openings over time. This assumes that acheiving a balance in the landscape is important to the viewer. Where observing more grassy openings in proportion to sagebrush is important, alternative 2 would be best. Where a view dominated by sagebrush is important, alternative 1 or 4 would be best.

Table II-12. Comparison of Alternatives Summary.

Measurement Indices	Alt 1	Alt 2	Alt 3	Alt 4
Wildlife				
Antelope Habitat Index (Existing =.65)	.52	.82	.84	.78
Antelope Habitat Quality	Decrease	Increase	Increase	Increase
Acres Burned in Elk Calving Areas	0	2613	1962	1217
Overall Effect on Elk Populations, Herd Structures	0	0	0	0
Overall Quality of Sagegrouse Habitat	Decrease	Decrease	Increase	Increase
Overall Change in Mule Deer Habitat	0	Decrease	0	0
Total Pounds of Forage Produced	25,703,150	38,556,000	33,735,650	31,058,150
Change in AUMs Available for Other Resources	- 3654	+ 4585	+ 1495	- 222
Landscape Diversity				
Maintenance of Aspen	Could Lose	Maintains	Maintains	Maintains
Acres of Sagebrush in Burn Units (Years 1-5)	0	14,994	8312	5766
Acres Actually Blackened in Mosaic	0	7497	4156	2883
Percent of 42,168 Acres of Sagebrush Blackened	0	18%	10%	7%
Percent of Alternatives in Major Successional Stages				
Early	0%	36%	18%	12%
Mid	0%	9%	9%	6%
Late	100%	55%	73%	82%

CHAPTER III

Affected Environment

CHAPTER III -- AFFECTED ENVIRONMENT:

General Introduction:

This chapter describes the existing condition of the environment that may be affected by the proposed action and alternatives. The Forest Plan management direction is briefly described followed by descriptions of the specific resources that will be affected.

The project area is located 35 miles south of Ennis, Montana in the Antelope Basin and Westfork Madison areas of the Madison Ranger District, Beaverhead National Forest. See Vicinity Map.

Forest Plan Management Direction:

The general management direction for the Beaverhead National Forest is found in the Forest Plan. Chapter II describes forest-wide goals, objectives, and standards. Chapter III describes the goals, objectives, and standards for sub-units of the forest referred to as Management Areas. The following discussions highlight the forest-wide and management area goals, objectives, and standards that are most relevant to the proposed action analyzed in this DEIS.

Forest-wide Goals, Objectives, and Standards:

The Forest Plan establishes a forest-wide goal to recognize and promote the intrinsic ecological and economic value of the wildlife and fisheries resources on the Beaverhead National Forest. This will be accomplished by providing diverse habitats to maintain viable populations of all native wildlife species to ensure diversified recreational opportunities and ecological stability (Chap II, page II-1).

Under Forest-wide objectives in wildlife, maintenance and enhancement of wildlife habitat has high priority in the management of the Forest. Viable populations of all existing wildlife species will be maintained by providing a diversity of habitats throughout the Forest. Habitat improvement projects including prescribed burning will be scheduled as appropriate to improve or maintain desired habitat conditions (Chap II, page II-3).

Vegetative diversity is important in maintaining suitable habitat for the wide array of wildlife species occurring on the Forest. Providing for vegetative diversity involves maintaining or developing over time an adequate number of acres of successional stages within each major vegetative community. Also important is maintaining specific habitat features necessary to individual species and groups of species (Chap II, page II-4).

The forest wide goal for grazing management is to provide opportunities for use of forage at or above currently permitted levels of use while protecting or enhancing fishery habitat, riparian areas, recreation and other forest resources (Chap II, page II-2).

A forest wide objective for domestic livestock is to keep the potential permitted animal unit months (AUM's) at about the same as currently permitted. Another objective is to identify non-structural range improvement opportunities such as use of prescribed fire to address sagebrush and Douglas fir encroachment (Chap II, pages II-8 and 9).

Forest wide objectives for fire provide for the use of prescribed fire to increase livestock and big game forage and facilitate stand reproduction in aspen (Chap II, page II-12).

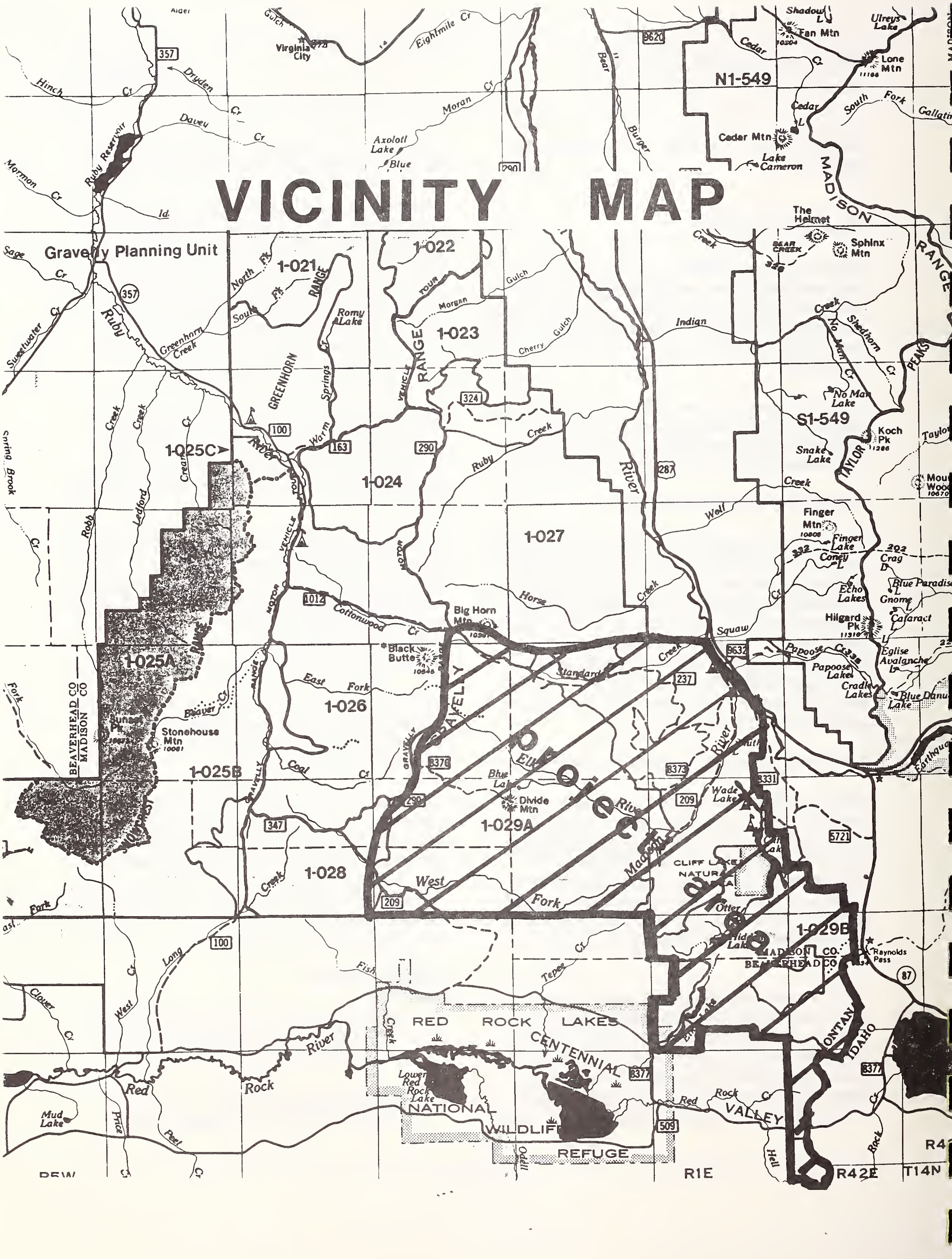
The protection of other resource values while achieving the purposes of the proposal is provided through application of standards specific to the resources. The following standards (Forest Plan, Chap II, pages II-25 thru 42) apply throughout the area and are especially important to this proposal. For purposes of brevity, a summary or key feature of the standard is presented.

Wildlife Standards:

1. Involve appropriate Montana Department of Fish, Wildlife and Parks personnel during project planning and implementation.

3. Utilize Agricultural Handbook No. 553, ***Wildlife Habitats in Managed Forests***, for

VICINITY MAP


Gravelly Planning Unit
1-021
1-022
1-023
1-024
1-025A
1-025B
1-025C
1-026
1-027
1-028
1-029A
1-029B
N1-549
S1-549
Project Area
Virginia City
Ruby Reservoir
Ruby River
Madison River
Madison Range
Greenhorn Range
Gravelly Range
Snowcrest Range
Taylor Peaks
Big Horn Mtn
Black Butte
Stonehouse Mtn
Sunset Pk
Divide Mtn
Cedar Mtn
Fan Mtn
Lone Mtn
Koch Pk
Finger Mtn
Hilgard Pk
The Helmet
Sphinx Mtn
Cliff Lake Natural Area
Wade Lake
Hidden Lake
Elk Lake
Reynolds Pass
Beaverhead Co
Madison Co
Montana
Idaho
Red Rock Lakes National Wildlife Refuge
Centennial Valley
Lower Red Rock Lake
Red Rock River
Mud Lake
R1E
R42E
T14N
357
100
163
290
324
287
87
237
209
347
509
8377
8376
8373
331
5721
1012
8620
8632

guidance in identifying strategies for management of various wildlife habitats.

4. Monitor indicator species to measure the effects of management activities on representative habitats. Sage Grouse is the management indicator species for sage brush communities.

12. Design of vegetative manipulation projects and grazing systems will consider potential impacts on wildlife, especially critical use areas such as calving and nesting areas.

Fisheries Standards:

2. Maintain instream fishery habitat for spawning, rearing and adult life stages.

Watershed Standards:

1. All projects affecting or suspected of affecting the watershed resource will incorporate Best Management Practices in project design and implementation.

3. Water quality will be maintained or improved in accordance with State and Federal Standards.

4. Best Management Practices will continue to be developed and refined during the environmental analysis process.

5. Projects involving significant vegetation removal will require a preliminary watershed cumulative effects analysis.

9. Adequate riparian vegetation will be left along water bodies for shade, streambank stability, pool quality and to filter overland flows.

Soils Standards:

1. All projects affecting or suspected of affecting the soils resource will incorporate Best Management Practices into project design and implementation.

2. Management activities will be designed to sustain site productivity.

Air Quality Standards:

1. Management activities affecting air quality will comply with Federal and State standards.

Range Standards:

3. Prescribed fire or other approved methods will be used for control of sagebrush and tree encroachment as needed to maintain or increase forage available for livestock and wildlife.

5. Livestock forage utilization on secondary range that is also key big game habitat will be managed to maintain reasonable wildlife populations as determined through coordination with MDFWP.

Fire Management Standards:

1. Prescribed fire will be used as appropriate to achieve management goals such as rejuvenation of rangeland vegetation and wildlife forage species and control of encroaching vegetation.

Management Area Goals, Objectives, and Standards:

In the Beaverhead Forest Plan, Management Area (MA) prescriptions found in Chapter III, include goals and management direction to achieve the Forest-wide goals, objectives, and standards found in Chapter II of the Plan.

Most of the burning proposals lie in MA 24, with a few in MA 1 and MA 14. Refer to the Management Area Map.

MA 24 lands are described as generally nonforested or sparsely forested. They contain significant wildlife habitat values and are within existing livestock grazing allotments. The lands contain the most productive and heavily used portions of range allotments and are suitable for high intensity range management practices. These areas generally have high livestock capacity and high levels of investment programmed for structural and non-structural improvements. These lands also include some of the most valuable acres of wildlife winter range, elk calving areas, security cover, and summer range with opportunities for wildlife habitat improvement.

The management goal for MA 24 is to protect and enchance wildlife habitat condition while maintaining or improving range vegetative condition and livestock forage productivity through management and cultural practices.

MA 1 lands are generally described as being a variety of nonforest, noncommercial forest, or forest lands unsuitable for timber production. Wildlife habitat values are high in some portions of the MA and domestic livestock grazing occurs on rangelands.

The management goals for MA 1 lands provide for custodial management with low levels of investment. Existing investments will be protected and where appropriate, maintained through low cost, low intensity improvements.

MA 14 lands consist of seeps, springs, and wet areas which are nonforested or unsuitable for timber management. These lands often contain key habitat components and have high wildlife values. Domestic livestock grazing occurs in existing allotments.

The management goals for MA 14 lands allow opportunities to maintain and improve wildlife habitat and water quality while permitting livestock grazing and some recreation opportunities.

Protection of other resource values while achieving the goals of the MA's is provided through application of standards specific to the MA. Management Area standards especially important in relation to this proposal are found in Chapter III of the Forest Plan (pages III-2 thru 4 for MA 1, pages III-44 thru 46 for MA 14, and pages III-76 thru 78 for MA 24).

MA 24 Standards:

Habitat Improvement:

Wildlife habitat improvements such as prescribed fire may be implemented so long as they are consistent with livestock management objectives.

Range Improvement:

Cultural practices and vegetative manipulation, including burning will be allowed to maintain or enhance forage production or species composition consistent with meeting wildlife habitat management objectives.

Prescribed Fire:

Prescribed fires can be used to increase range forage production and address encroachment by Douglas fir. In key wildlife areas, wildlife forage needs must be met. Prescribed fire can also be used to enhance the quality of wildlife habitats.

MA 1 Standards:

Habitat Improvement:

Wildlife habitat improvement projects will generally not be developed unless needed to correct existing habitat degradation.

Range Improvement:

Existing improvements will be maintained and new improvements will be allowed to facilitate management or protect existing resource values.

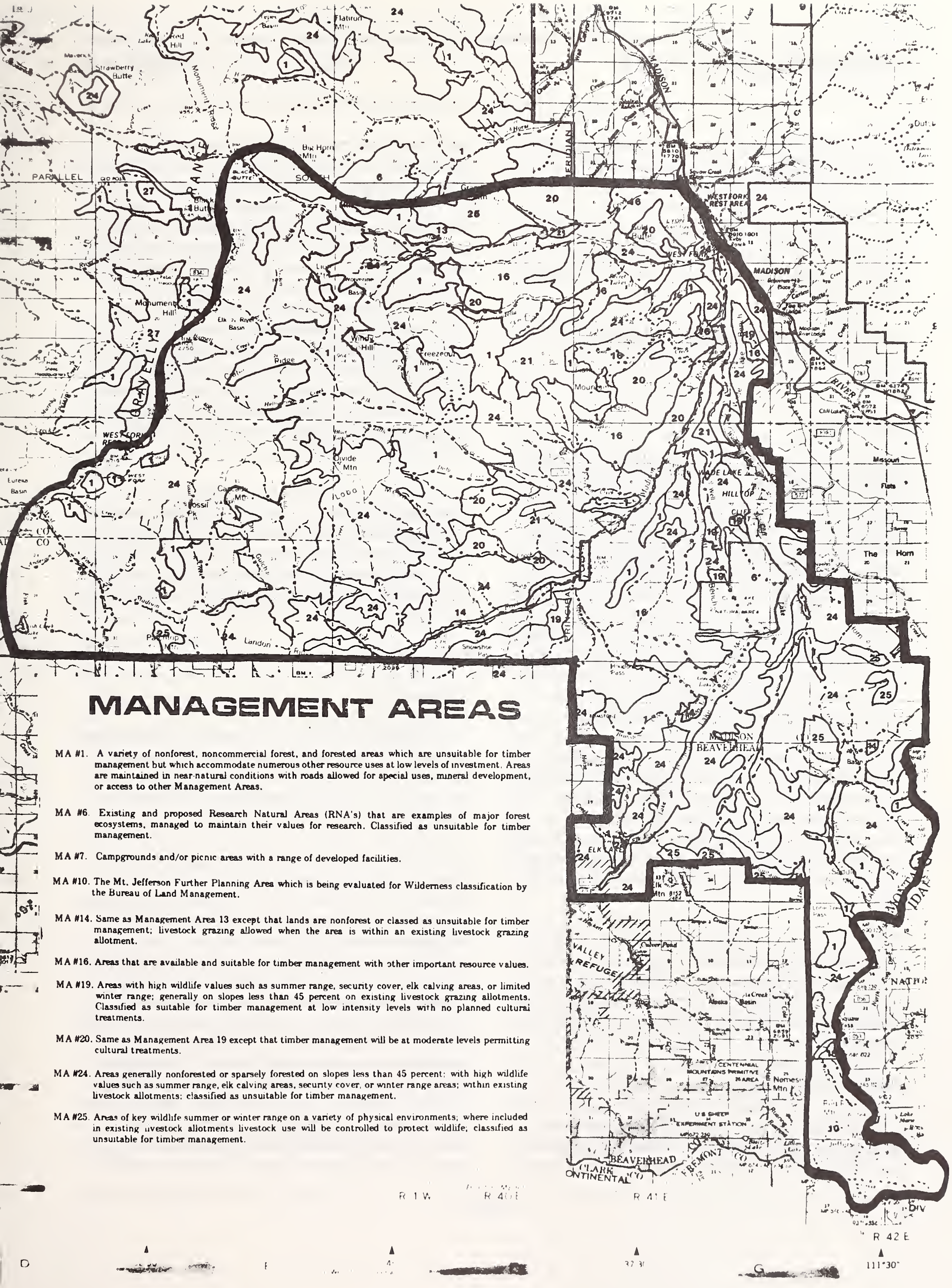
Prescribed Fire:

Prescribed fires with planned or unplanned ignitions may be used as resource improvement tools.

MA 14 Standards:

Habitat Improvement:

Habitat improvement projects including road management, prescribed fire, structures, and other techniques will be used to maintain or



Flatiron Mtn
Strawberry Butte
Monument Ridge
Big Horn Mtn
PARALLEL
SOUTH
Black Butte
GRAVELLY
Monument Hill
Elk River Basin
Ridge
Windy Hill
Freezeout Mtn
Wolverine Basin
Divide Mtn
Lobo Mtn
Cascade Mtn
Fossil Pk
Eureka Basin
Landon
Snowshoe Pass
Hidden Pass
MADISON
MERIDIAN
Squaw Creek Ranch
WEST FORK REST AREA
Cub Butte
LYON
MADISON
Deadman
Madison River Lodge
RIVER
Missouri
Flats
WADE LAKE
HILLTOP
CLIFF
The Horn
MADISON
BEAVERHEAD
ELK LAKE
Elk Mtn
VALLEY REFUGE
Culver Pond
Alaska Basin
CENTENNIAL MOUNTAINS PRIMITIVE AREA
Nemesis Mtn
U S SHEEP EXPERIMENT STATION
BEAVERHEAD
CLARK CO
FREMONT CO
CONTINENTAL
MONTANA
IDAHO
NATIONAL
R 1 W
R 40 E
R 41 E
R 42 E
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27

MANAGEMENT AREAS

MA #1. A variety of nonforest, noncommercial forest, and forested areas which are unsuitable for timber management but which accommodate numerous other resource uses at low levels of investment. Areas are maintained in near-natural conditions with roads allowed for special uses, mineral development, or access to other Management Areas.

MA #6. Existing and proposed Research Natural Areas (RNA's) that are examples of major forest ecosystems, managed to maintain their values for research. Classified as unsuitable for timber management.

MA #7. Campgrounds and/or picnic areas with a range of developed facilities.

MA #10. The Mt. Jefferson Further Planning Area which is being evaluated for Wilderness classification by the Bureau of Land Management.

MA #14. Same as Management Area 13 except that lands are nonforest or classed as unsuitable for timber management; livestock grazing allowed when the area is within an existing livestock grazing allotment.

MA #16. Areas that are available and suitable for timber management with other important resource values.

MA #19. Areas with high wildlife values such as summer range, security cover, elk calving areas, or limited winter range; generally on slopes less than 45 percent on existing livestock grazing allotments. Classified as suitable for timber management at low intensity levels with no planned cultural treatments.

MA #20. Same as Management Area 19 except that timber management will be at moderate levels permitting cultural treatments.

MA #24. Areas generally nonforested or sparsely forested on slopes less than 45 percent; with high wildlife values such as summer range, elk calving areas, security cover, or winter range areas; within existing livestock allotments; classified as unsuitable for timber management.

MA #25. Areas of key wildlife summer or winter range on a variety of physical environments; where included in existing livestock allotments livestock use will be controlled to protect wildlife; classified as unsuitable for timber management.

enhance wildlife habitat quality where compatible with other MA goals.

Prescribed Fire:

Prescribed fire, with planned and unplanned ignitions, may be used for range and wildlife habitat improvement.

Description of the Affected Environment:

Wildlife:

Affected Area:

The area that will be analyzed for direct and indirect effects is the 42,168 acres of sagebrush communities in which burning is proposed. Cumulative effects will be analyzed within an area of approximately 161,170 acres encompassing the entire Antelope Basin area and the southern end of the Gravelly Range in the West Fork Madison area.

In these 2 areas, sagebrush/grassland with aspen and conifer patches dominate the landscape and wildlife habitats are diverse. The nine lakes in the area, (Conklin, Cliff, Wade, Elk, Smith, Goose, Otter, Blue, and Hidden) provide habitats for species found nowhere else on the Beaverhead. Conklin Lake is privately owned. Of particular importance is the Trumpeter swan which nest and winter on several of the lakes. The Trumpeter swan is listed as a sensitive species for the Beaverhead, (Caring For Our Natural Community, Region 1) and also as a management indicator species for marshland communities in the Forest Plan.

The study area provides habitat for mule deer, antelope, elk, and moose for spring through fall seasons. Calving and fawning areas for these species are present. The study area also provides habitats for a wide variety of small mammals and songbirds.

Past Management:

Past activities that have contributed the most to existing habitat conditions are domestic livestock grazing and other vegetative manipulation projects. Sagebrush and grassland communities have been grazed for many decades. In the 1960's and 70's, large acreages of sagebrush were sprayed to increase forage production. Recent sagebrush burns, 6000 acres in the past 5 years, are very attractive to antelope, deer and elk, as they readily take advantage of the early greenup and highly nutritious forbs and grasses erupting from the burn. During these same periods and into the 80's, several thousand acres of wyethia were sprayed. Treatment of aspen stands was initiated around 1982 and since that time, approximately 200 acres of decadent aspen have been regenerated by burning or cutting. Refer to the Vegetation section in this chapter for more detailed descriptions of these elements.

Big game hunting and road management are additional activities that influenced wildlife habitats and populations. As per the current Interagency Visitor Map, the entire study area is being managed as an area restriction with many specific roads and trails also restricted seasonally or yearlong to motorized use.

Existing Condition:

Big Game:

The following discussions will describe the existing conditions of habitats for mule deer, antelope, and moose. Elk conditions will be discussed within the section covering management indicator species.

Mule deer habitat is provided throughout the study area but is primarily spring, summer and fall range. Mule deer use the sage in the summer and fall for cover though they do not appear to be dependent on the brush for food. This is probably due to the presence of more palatable, more succulent forbs during that part of the year. During hunting season, the sage can provide good hiding cover on an otherwise exposed hillside or flat. There is no permanent winter range in the West Fork or Antelope Basin areas. The nearest winter range for deer is near the mouth of Horse Creek south of the Wall Creek Game Range. Deer also migrate from Centennial Valley to wintering areas in Madison River moving parallel to the chain of lakes, staying close to the timber along

Hidden Lake Bench, Deer Mountain, and Spring Branch.

Antelope are found throughout the sagebrush and grassland areas. Spring, summer and fall range is provided. There is no antelope winter range in the study area.

Existing habitat suitability is described using the U.S. Fish and Wildlife Habitat Suitability Index model. This model calculates suitability of habitat based on several factors including height of vegetation, shrub canopy cover, distance from water, grazing use by livestock, topographic diversity, and diversity of forbs and forb canopy cover. Currently, the habitat is rated at .65 out a possible 1.0.

Studies in Wyoming and Colorado have shown that stands of sage taller than 30 inches covering more than 30% of an area tend to block an antelope's vision and cramp its sprinting style. Sage in the south Gravellies may approach 30 inches in height but that would probably be maximum for most plants.

Raynolds Pass is heavily used by antelope during migration from the Madison River drainage into Idaho. Lone Tree Pass in Antelope Basin is used by antelope going between the Centennial Valley and the Madison drainage.

The West Fork and Antelope Basin drainages provide yearlong habitat for moose. In the fall and winter, moose will spend most of their time in and around the riparian zones.

Non-game Species:

The study area contains a broad diversity of habitats for non-game species. Habitat needs for non-game species (food, cover) do not generally differ from big game species however, the needs can often be met over a much smaller areas. For this reason, species that are more directly related to sagebrush, grassland, and aspen communities will be discussed.

Brewer's sparrow and sage sparrow are two sage dependent species found in the Gravellies sagebrush stands. Other birds found in the sage stands which are "near-obligates" include green-tailed towhee and vesper sparrow. These 2 species are very common in this area. The open grassland areas provide habitats for species such as longspurs, meadowlark, horned lark, and mourning dove.

Aspen communities provide habitat for species such as warbling vireo and sapsuckers. These two species are almost exclusively dependent on aspen and would be the first to leave should an aspen stand deteriorate or die out.

Beaver are found throughout the study area. While they are a game animal (fur bearer) from the standpoint of being regulated, we chose to discuss them here as their habitat needs again, are generally more localized. Current beaver populations appear to be suppressed from a combination of trapping and habitat changes. Regulation of trapping is outside the responsibility of the Forest Service as well as beyond the scope of this analysis. Habitat conditions are within the control of the Forest Service.

Beaver habitat is confined to riparian areas. Within the study area, the riparian areas important to beaver contain willow or willow/cottonwood/aspen complexes. The aspen component is the element most affected in this analysis. Aspen provides an important food source and construction material. Many of the aspen stands in the area are reaching advanced ages and in some cases have died out. Maintenance of healthy aspen stands is an important element of maintaining or improving beaver activity and populations in the area.

Management Indicator Species:

The method of using indicator species is based on the assumption that by managing habitat in a way that allows viable populations of these species to develop and sustain themselves, we will provide for populations of all vertebrate species dependent on those habitats (Beaverhead Forest Plan, p.II-1). A "viable" population is one of sufficient size, structure, and distribution to sustain normal rates of recruitment and genetic diversity without requiring immigration.

Elk:

Elk are identified on page II-26 of the Forest Plan as the Management Indicator Species for big game species.

The elk in the Gravellies are part of the Gravelly/ Snowcrest herd. Summer range covers approximately 5,000 square miles from Centennials to the south, Blacktail to the west, to the north end of the Gravellies and east to the Madison River.

The Montana Fish Wildlife and Parks has been conducting an elk study in which calving locations have been mapped. The Antelope Basin area contains a relatively scattered distribution of locations. No particularly high concentrations have been identified, although it appears that the heads of Antelope, Anthill, and Poison Creek drainages contain the largest numbers of relocations. In the West Fork area, high concentrations of locations are found on the south facing breaks between Teepee and Lobo Creek. Details of the study and mapped calving locations are available in the project file.

Ken Hamlin, Montana FW&P biologist in charge of the elk study emphasized in a Sept. 20, 1990 letter to the Forest Service that the radio relocations represent "general" areas of importance but do not say anything about areas with no relocations. The 764 relocations however are by far and away the best data that is available showing elk calving areas.

A series of prescribed burns in October of 1986 removed 1500 acres of sagebrush on Elk Mountain. Radio locations subsequent to that burn has not indicated any calving changes in and around the burn.

Present elk populations are at the Montana Fish Wildlife and Parks goal of 7000 - 7500 for the Gravellies Planning Unit. One important point to note is that the elk population continued to increase following the large sagebrush spraying program in the area during the 1960's and 1970's. It appears that the sudden reduction in sagebrush did not adversely effect the elk's upward population trend. State population estimates made for the Wall Creek and Blacktail-Robb-Ledford each spring during the 1960's and 1970's spray program also showed an upward trend with the end result being a near doubling of elk populations at the end of the program.

Elk are at the highest densities in the West Fork area in the upper elevations where cover, water, and seclusion from man permits a relatively unharried existence. Sagebrush near the conifer stands appears to be used by the elk for calving and a minor amount of feeding. Elk, being primarily a grazer rather then a browser, tend to use sage as a minor component of their diet except during winter when the grasses and forbs become more difficult to reach. During harsh, deep snow winters, sage becomes critical to both deer and elk as grass becomes nearly impossible to reach. For this reason, sage becomes very important on critical winter ranges.

The majority of the elk migrate out of south end of the Gravellies to Wall Creek and west to the Blacktail Management Area. Elk do winter in small herds in the West Fork during mild winters. Some of this area would be considered winter range for mild winters, but not for normal or severe winters. A map is enclosed with this document delineating winter range.

Predation and hunting pressure were also reviewed as factors in the condition of the elk herds. Conversations with state biologist Terry Lonner have indicated that predation on elk calves in the Gravellies is not and has not been a problem. Hunting pressure in the West Fork is very high. Road hunting is very popular as is hunting from horseback in upper Elk River and West Fork. The current population and structure of the elk herd is more a factor of hunting than of habitat conditions.

Pine Marten:

The pine marten is the management indicator species for spruce/alpine fir old-growth communities. Marten are resident in the project area even though there are very few stands of spruce/fir that contain old growth characteristics. In lieu of this, martin are using mixed-species stands of mature timber dominated by Engelmann spruce and alpine fir. They prefer stands with abundant coarse woody debris on the forest floor which helps maintain a complex subnivean (under-snow) environment in winter. Habitat blocks of this sort occur in the upper elevations of the Gravellies. Marten also forage extensively in stands of over-mature and old-growth lodgepole pine, which are adequately represented here.

There is little direct population data on pine marten. The majority are undoubtedly located in the upper elevations in the older conifer stands. Sagebrush and Savannah/grassland habitats are of little value to pine marten. There are no direct, indirect, or cumulative effects to pine marten expected from the burning proposals.

Sage Grouse:

Sage grouse are identified in the Forest Plan as the management indicator species for sagebrush communities.

Sage grouse populations appear to have gone through some wide fluctuations over the past several decades. Current populations are low and seem to be stagnant.

Historical records of state regulations show widely fluctuating regulations based on occurrance of the grouse. The early 1940's appeared to be an all time low population. In 1942, the state reintroduced sage grouse in Madison County in an effort to re-establish grouse in the valley. In 1945 the state had a closed season statewide on sage grouse due to low populations. By the 1960's, the populations had rebounded somewhat though since that time, it has declined once again.

In a joint field examination with Montana Fish and Game Department in 1970, and during the course of range analysis work prior to spraying, there was no evidence of any sage grouse in or near the spray areas. (2240 Multiple Use Survey Report signed March 8, 1971). The report states "We do not anticipate any adverse impact on upland game birds from this spray project." Apparently the grouse population was low prior to the 70's spraying.

The large spray projects likely contributed to the decline in populations between the 60's and 70's. There are other factors which also may have contributed to the decline and the subsequent slow recovery of the populations.

Present habitat is deficient in brood habitat for sage grouse. There are very limited riparian areas in Antelope Basin and West Fork which are important feeding sites. No leks (breeding sites) have been located within the drainage.

Another limiting factor for the sage grouse populations appears to be the development of critical winter range. Many of the Centennial Valley grouse migrate to Idaho south of Monida Pass. Many of the sage bottoms in Idaho have been recently converted to irrigated pasture. While the winter range of the sage grouse from Antelope Basin and West Fork is not known, it is suspected the birds may also migrate to Idaho. Several winter surveys in 1989 and 1990 failed to locate any wintering birds in the analysis area.

Considering the increasing acreage of sage in the Gravellies and the low stagnant population of grouse, it is doubtful that condition of the sage itself is the present limiting factor.

Goshawk:

Goshawk is identified in the Forest Plan as the management indicator species for old growth Douglas-fir habitats.

There are no known goshawk nests within the project areas though they undoubtedly nest in the douglas fir and pine stands in the upper elevations. The general area appears to support a small but consistent goshawk population. Goshawks make use of complex mixed-species stands of large trees (lodgepole, spruce, alpine fir, as well as Douglas-fir).

While predominantly a forest bird, goshawk will occasionally hunt meadow edges for small mammals and will, on occasion, use aspen stands for hunting or nesting.

Trumpeter Swan:

The trumpeter swan is identified in the Forest Plan as a management indicator species for marshland communities. The swan is also listed as a sensitive species for the Beaverhead National Forest. (Caring for our Natural Community, Region One).

Trumpeter swan nest on Elk lake (two historical nest sites) and also have historically nested on Goose Lake. Swans will winter on the south end of Cliff Lake until the lake freezes over. Conklin Lake, a privately owned lake in Antelope Basin, has a swan nest every year on it. In 1990, four young were hatched, and two birds fledged. Their activities are completely restricted to the lake until after fledging.

Sensitive Species:

Sensitive wildlife species that may be in the area include the boreal owl, harlequin duck, ferruginous hawk, trumpeter swan and the western big-eared and spotted bats. Trumpeter swan were discussed above.

Boreal owl probably are present in the upper elevations though none have been found. The birds typically are found in old growth lodgepole or spruce.

Western big-eared bat and spotted bats may be present but there has been very little data gathered on these species either on the Beaverhead or in other areas within their ranges.

Spotted bats appear to be primarily desert dwellers. The most probable range in Montana occurs in south central and southeastern portions of the state. They possibly could occur on the south end of the Gravelly Range but non have been observed in the project area.

Western big-eared bat is likewise unknown as to its presence in the Gravellies. They occupy a wide range of habitats from arid to high elevation mixed coniferous forests. All of southwestern Montana and the Beaverhead are in their potential range. Possible roost sites include caves and abandoned mine shafts. No western big-eared bats have been observed in the project area.

Personnel at the Red Rock Lakes National Wildlife Refuge were also contacted and they have no records of the two species of bats being found within the refuge.

Harlequin duck is not known to have ever been present in Gravellies.

It is not expected that any of the action alternatives will impact the boreal owl, spotted bat, western big-eared bat, or harlequin duck. None of these species have been observed in the project area and their probable habitats will not be affected.

Ferruginous hawk are present in the West Fork and are fairly common. They are known to be nesting in the sagebrush dominated hillsides in the Patchtop Mountain, Landon Ridge, Snowshoe Pass areas of the Westfork Allotment. They are quite common in the Centennial Valley to the south. Cottontails and jackrabbits comprise most of the bird's prey biomass. Nesting preference is for trees in shrubland/grassland habitat though they will nest in stream bottoms or on the ground where trees are not available.

Threatened & Endangered Species:

The Forest Plan lists four Threatened/Endangered indicator species: peregrine falcon, bald eagle, grizzly bear, and grey wolf. These same species were also identified by the U.S. Fish and Wildlife Service as being potentially in the drainage and should be considered in the analysis (Sept. 14, 1990 letter). The species are also listed in the Region 1 publication, **"Caring for our Natural Community"**.

Grizzly Bear - Threatened Species:

Grizzly bear habitat is excellent in the Gravellies, but due to past human interaction, the grizzly is considered an incidental user. Habitat types which seem to be preferred are *Festuca idahoensis/ Agropyron spicatum*, *Geranium viscosissimum*, *Campanula rotundifolia*, *Geum triflorum* for the grassland/shrublands, and *Abies lasiocarpa/ Calamagrostis rubescens*, *Abies lasiocarpa/ Vaccinium globularae* or *V. scoparium* in the forested areas. The berry crops and whitebark pine seeds are seasonal food sources which are heavily used on good years. The locations of these vegetation types are for the most part in higher elevations in the Gravellies and along the riparian zones. The Gravellies are not listed in a Situation Management Area, though approximately one sighting every two years is reported.

Grizzly bears have been occasionally reported near Wade Lake and one reported just south of Antelope Basin in 1987. In 1990, a grizzly bear was found in the Granite Mountain area and a grizzly was also seen at Cliff Lake and later in the summer in the campgrounds of Cliff and Wade Lake. The Gravellies are not within a recovery area despite its history of sightings and its close proximity to other recovery areas. (Targhee National Forest land to the south of the Antelope Basin area is in Situation 2.)

This area has not been analyzed through the grizzly bear habitat process, but it appears that the Cliff Lake Natural Area, Deer and Elk Mountain, and Red Rock Mountain areas have the potential to hold bears for part of the year. Conflicts with grazing and the transportation system probably are the limiting factors for the grizzly bear in these areas.

Since the listing of the grizzly bear on the T&E species list, there has been one confirmed man-caused grizzly bear mortality in the Gravellies.

Grey Wolf - Endangered Species:

Wolf have been regularly reported in the Gravelly and Tobacco Root ranges, the last report being two years ago on the Madison District. A total of 180 sightings have been reported on the Beaverhead since 1964. Most sightings have been one or two animals, with young rarely seen. No pack activity has been reported so it is suspected the population is probably low with only immediate families scattered throughout the drainage if present at all. This is similar to the estimate given in the 1926 Grazing Management Plan for Madison National Forest where it states an estimated five or six wolves are present in the Upper Ruby/ Gravelly Range.

Bald Eagle - Endangered Species:

Since the spring of 1988, bald eagles and other raptors around the chain of lakes have been studied in an effort to make a nest plan for each of the eagle nest sites. A detailed description of existing condition and desired future condition will be written in the nest plan. Listed below however is some of the information gathered at this time.

Results from this years' research indicate a lack of alternate nest trees for ospreys, stemming from the lack of old yet healthy trees near the lakes. Nest trees for eagles are probably adequate. Habitat can probably support up to 4 nesting pairs of eagles.

The Lost Mine Canyon trail currently passes close to one of the active eagle nests and poses a conflict during nesting season. Current regulations allow both foot and trail bike use on the trail. The trail was moved in 1990 to reduce disturbance.

The Antelope Prong and Neely's arm of Cliff lake are important fishing areas for both nesting and immature eagles during the spring rainbow and sucker spawning runs. Eagles immediately leave the Antelope Prong feeding area when anyone use the Lost Mine Canyon trail which crosses the creek. This disturbance is of short duration however, as eagles will return within 1/2 hour.

Peregrine Falcon - Endangered Species:

Peregrines are occasionally reported in the area, though none have been found nesting. To the south of the forest, there are several pairs of peregrines which have been hacked (artificially planted into the wild) in addition to a natural pair near Centennial Valley. Because of the close proximity of these birds plus the abundance of waterfowl in the chain of lakes, there is a good possibility of peregrines nesting on the forest either now or in the near future.

The lynx and wolverine are two candidate T&E species that may use habitats in the project area, but neither has been reported by trappers or field biologists in recent years.

Landscape Diversity:

Affected Area:

The affected area includes the 161,170 acres of land found within the West Fork/Antelope Basin analysis area. The proposed action is confined to the 42,168 acres of sagebrush/grass vegetation in the West Fork/Antelope Basin area. Lessor areas of open conifer/grass and aspen will also be treated. Areas to be treated are located in the southern half of the study area. Approximately half of the units are in Antelope Basin with the other half found in a band two to three miles wide following the West Fork of the Madison river. A detailed description of this vegetation can be found in the vegetation section of this chapter.

Past Activities:

With landscape diversity tied to the vegetation of an area, any manipulation of the different vegetation types will cause a change in diversity. Past activities affecting the sagebrush/grass vegetation which have occurred in the area include livestock grazing, sagebrush and Wyethia treatment with herbicides and fire, aspen treatment and conifer encroachment treatment. For more detail on these past activities refer to the vegetation and livestock sections of this chapter. Another factor that has affected the current landscape diversity of the area is past and current wildfire suppression activities. As discussed in the vegetation section of this chapter due to the lack of natural fire the sagebrush/grass, aspen and open conifer vegetation is in quite a different state than would naturally be found in this area.

Existing Condition:

Landscape diversity as defined in this document is "the geography of different ecosystems across a large area and the connections among them." (USDA Undated). Overall landscape diversity in the West Fork/Antelope Basin area is quite high. The vegetation runs from grassland and wet meadows, to sagebrush/grass slopes, to willow and aspen stands, to open conifer/grass stands to dense coniferous forests. The topography of the area is as varied as the vegetation. There are high open plateaus, mesas and rough rocky mounatinous terrain, large open valley bottoms and high flat benches and open basins. The area includes the West fork of the Madison river, Standard Creek and the Chain of lakes; Elk Lake to Smith Lake. The elevations range from 6,000 feet on the lower West Fork of the Madison River to over 10,000 feet on the Gravelly crest.

The general cover types for the West Fork/Antelope Basin area are summarized in Table 1 below.

Table III-1.
Cover Types by acres*
West Fork/Antelope Basin area
Total acres in study area--161,170

Non-Forested	60,152	37%**
Water	1,256	<1%
Rock	2,670	2%
Marsh	167	<1%
Meadow	1,239	1%
Browse(Willow)	1,331	1%
Sagebrush/grass	42,168	26%
Grassland	11,321	7%
Forested	101,018	63%
Conifer	95,664	59%
Open Canopy	18,793	12%
Closed Canopy	76,871	48%
Aspen	5,354	3%

* Acres are compiled from the Districts Timber Stand Data Base and Allotment Management Plans.

** Percentages are based on total acres in study area.

Table 1 gives a general idea of the landscape diversity but does not begin to show how these broad catagories are interspersed throughout the area. In general the northern half of the study area is dominated by a closed canopy, dense conifer forest with scattered patches of aspen and small openings of sagebrush/grass, grassland and meadow vegetation. In the southern half of the area this is reversed. The landscape is dominated by large open basins and high flat benches of sagebrush/grass and grassland vegetation with scattered patchs of dense conifer forest and aspen.

Landscape diversity is not confined to the placement and connections of these broad catagories within an area. There is diversity within each catagory. As an example, on a large forested slope there are variations in tree density and structure. Different tree species will produce different color shades and textures. All these differences combine to produce a landscape diversity within the forested hillside. This is also true for the sagebrush/grass vegetation.

Landscape diversity within a vegetation type is generally dependant on the density and structure, vertical and horizontal, of the dominant vegetative layer, ie. trees, shrubs, grass. Landscape diversity is not static but is constantly changing. Between the major vegetation types changes are slow. Changes within a vegetation type like the sagebrush/grass can be fairly rapid.
The current diversity in the 42,168 acres of sagebrush/grass vegetation is mainly due to past management activities. With the Sagebrush in the area growing only 1 - 4 feet tall the vertical structural variability is not very great. The main element that affects the landscape diversity in the sagebrush/grass type is the density or canopy cover of the sagebrush along with the horizontal structure or placement of the plants. Canopy cover for the sagebrush/grass type in the West Fork/Antelope Basin area break out as follow.

Table III-2. Canopy Cover for the Sagebrush/grass type
West Fork/Antelope Basin Area

CANOPY COVER	ACRES
0% TO 5%	8,251
6% TO 10%	8,821
11% TO 15%	14,557
16% TO 20%	8,378
21% +	2,161
TOTAL	42,168

Again, this only gives a general view of how the sagebrush/grass type is broken out and does not show how the different canopy covers are distributed throughout the study area. These figures are not static. Those stands currently having 0% to 5% canopy cover will over time generally increase their sagebrush cover, moving toward the heavier catagories. The current appearance of these sites, 0%-5% canopy cover, is one of an open grassland with scattered shrubs. The shrubs may be scattered individually throughout the area or found in small clumps interspersed across the site. As canopy cover increases, up to 15%, the general appearance of the site changes to a shrub dominated site with scattered patches of grassland. The open grassy patches are still an obvious component and may be interconnected. When canopy cover increases over 15% to 20% the open patches become smaller and will eventually become inconspicuous. These sites appear as shrubland stands with few small open pockets of grasses and forbs. The open pockets generally are open and do not interconnect.

This general description is as if you were viewing a distant slope or were looking down from a hill top. As site distance decreases and topography flattens the general appearance will compress toward the higher canopy covers. Sites will seem to have heavier canopy covers than they actually do. Sites with canopy covers of 10% to 15% will appear as heavy stands of shrubs with few grassy openings.

Aspen is found scattered throughout the area providing its' seasonally changing contribution to the overall landscape diversity. The current condition of the aspen stands and the potential changes that may occur in the West Fork/Antelope Basin area are describe in the vegetation section of this chapter.

The encroachment of conifers out into the sagebrush/grass vegetation adds to the overall diversity of the landscape. It provides for an increase in the structural variation on the site. Currently the encroachment is found in narrow bands along the edges of the sagebrush/grass vegetation. There are some sites that are encircled by heavier timber that have become completely dominated by conifers. In comparing aerial photography from the late 40's and 50's to current photos it can be seen that many area viewed as sagebrush/

grass vegetation with scattered conifer encroachment in the 50's are now dense conifer stands. Sites where conifer encroachment is currently found can be seen as open sagebrush/grass areas with no conifers in the 50's.

As stated earlier this situation only increases the landscape diversity of the area but given time these sites will develop into dense conifer stands. At that time there would be a reduction in the diversity in the area. This is the natural succession for the site in the absence of natural wildfires. The past wildfire suppression activities has allowed many of the sites viewed as open conifer/sagebrush sites in the 50's to develop into the dense stands currently found. This process will continue until those sites currently with scattered conifer encroachment have developed into closed canopy conifer forests. If a catastrophic event such as fire, wild or prescribe, occurs on the site this process will be setback. The appearance of the site after fire would depend on its' intensity. Generally a hot intense fire would kill most trees and revert the site back to a open grassland site. Lighter intensity fires would usually produce an open park like stand of conifers/grass.

Vegetation:

Affected Area:

The proposed action would affect the sagebrush/ grass, open conifer/grass and aspen vegetation types located within management areas that allow the use of prescribed fire for range and wildlife habitat improvement. Within the West Fork and Antelope Basin area this includes MAs 1, 14, and 24. Direct affects of the alternatives would occur in these areas.

Vegetative cover in the study area is quite varied, with open grasslands and wet meadows, to sagebrush/grass slopes, to willow and aspen complexes and open conifer/grass stands to dense coniferous forests. Topography is varied and includes the West fork of the Madison River bottom, large open valley bottoms, high flat benches and open basins to high plateaus, mesas and rough rocky mountainous terrain. Elevations range from 6000 feet on the lower West fork of the Madison to over 10,000 feet on the Gravelly crest. The proposed action would occur from 6000 to 8300 feet. Stands proposed for burning will predominately be in the Sagebrush/grass vegetation type. Some stands of open conifer/grass and aspen are also proposed for burning. Within any of these stands small portions of open grassland, meadows or willow may be found. These vegetation types may be treated along with the sagebrush.

See Table 1 in previous discussion for a summary of the general vegetation types in the West Fork/Antelope Basin area.

Within the study areas 42,168 acres of sagebrush/ grass vegetation type, four species of sagebrush are found. The dominant species for the entire area is Mountain Big Sagebrush, *Artemisia tridentata spp. vaseyana*. This is the species for which the fire treatment is targeted. Basin Big Sagebrush, *Artemisia tridentata spp. tridentata*, is found south of the study area in the Centennial Valley. Three Tip Sagebrush, *Artemisia tripartita*, and Silver Sagebrush, *Artemisia cana*, are found throughout the area but generally at very low densities. Both species may sprout after fire; for this reason sites where either species dominate generally have been excluded from treatment. The one remaining species, Alkali Sagebrush, *Artemisia longiloba*, is found in very small, scattered patches toward the western edge of the study area. Acreage of this species is limited and no treatment is planned.

Although sagebrush is the dominant shrub in the area a variety of other shrub species are associated with it. On the moist end of the vegetation type we also find Wood's Rose, *Rosa woodsii* and Mountain Snowberry, *Symphoricarpos oreophilus*. Toward the drier end of the type Snakeweed, *Gutierrezia sarothrae*; Rubber Rabbit-brush, *Chrysothamnus nauseosus*; Green Rabbit-brush, *Chrysothamnus viscidiflorus*; and Gray Horse-brush, *Tetradymia canescens* are found associated with sagebrush. These species do not occur in any great abundance within the study area. All of these shrubs do sprout after fire with the later four species known to greatly increase in coverage after fire.

The dominant grass understory species for the West Fork/Antelope Basin area is Idaho Fescue. Four other grasses fill out the major graminiod species in the area, Bluebunch Wheatgrass; Mountain Brome, *Bromus carinatus*; Western Needlegrass, *Stipa occidentalis*; and Bearded Wheatgrass, *Agropyron caninum*. Other usually conspicuous species include Junegrass, *Koeleria cristata*; Raynold's Sedge, *Carex raynoldii*; and Sandberg's Bluegrass, *Poa sandbergii*.

Within the Gravelly range we find a very high number of forb species associated with sagebrush. Of the forb species Sticky Geranium, *Geranium viscosissimum*; Soft Cinquefoil, *Potentilla gracilis*; and Silky Lupine, *Lupinus sericeus* dominate. Other common species include Rose Pussy-toes, *Antennaria microphylla*; Prairie Smoke, *Geum triflorum*; Hood's Phlox, *Phlox hoodii*; and Rocky Mountain Helianthella, *Helianthella uniflora*. In localized areas in the upper reaches of the West Fork and high drainage basins in Antelope Basin the broad leaved forb Wyethia or Mulesear, *Wyethia amplexicaulis* and *W. helianthoides*, may dominate.

Following Mueggler and Stewart, "Grassland and Shrubland Habitat Types of Western Montana" the Sagebrush/grass vegetation in the study area would fall into four habitat types (h.t.) with one phase described. The major h.t. for the study area is Big Sagebrush/Idaho Fescue(*Festuca idahoensis*). The wetter end of this h.t. can be further split into the Sticky Geranium(*Geranium viscosissimum*) phase. With on going soil/ecotype mapping in this area additional phases may be described to break out sites which support Silver and Three Tip Sagebrush intermixed with Big Sagebrush. The Big Sagebrush/Bluebunch Wheatgrass(*Agropyron spicatum*) h.t. is located on the dry, steep, south facing slopes toward the lower end of the study area. This is a minor h.t. in the area. The Three Tip Sagebrush/Idaho Fescue h.t. found in the southeast end of the study area also has a limited distribution. The Alkali Sagebrush sites found in the study area would fall within the Low Sagebrush(*Artemisia arbuscula*)/Idaho Fescue h.t..

The few open conifer/grass sites that are considered for treatment are where Douglas Fir (*Pseudotsuga mensiesii*) has encroached out into the Sagebrush/grass vegetation. The majority of the encroachment at this time is confined along the edges of the sagebrush/grass vegetation type but some stands have been completely dominated by conifers. Approximately 1622 acres of conifer encroachment have been identified within burn units. This encroachment, in the absence of fire, is the natural progression for these sites. The habitat type most likely to develop on those sites currently dominated by conifers is a Douglas Fir/Pinegrass (*Calamagrostis rubescens*) (Pfister and others 1977). This is similar to conifer stands currently growing adjacent to the units. If the natural succession for these sites continues; in the absence of fire; the Douglas-fir canopy will fill and outcompete the sagebrush/grass species. As the conifer overstory closes the shrub, graminoid and forb species now present on the site would be replaced by more shade tolerant species such as Pinegrass, Elk Sedge(*Carex geyeri*), and Heart-leaf Arnica(*Arnica cordifolia*).

Aspen(*Populus tremuloides*) is found scattered throughout the West Fork/Antelope Basin area. Approximately 5,354 acres of aspen are mapped in the area. Stands range in size from small half acre clones to large 10-20 acre stands. Understory vegetation can be quite varied in aspen stands. The understory can be multi-layered with a shrub, graminoid and forb layer or be restricted to only a graminoid or forb layer dominated by one species. Some of the more common plant species are, Mountain Snowberry, Oregon Grape(*Berberis repens*), Mountain Brome, Blue Ryegrass(*Elymus glaucus*), Sticky Geranium and Wyethia. Many stands also contain scattered conifers, generally Subalpine Fir(*Abies lasiocarpa*), Douglas Fir or Lodgepole Pine(*Pinus contorta*). The condition of the aspen in the area is quite varied. Aspen is maintained on many sites by natural catastrophic events such as fire. In the absence of such events the natural succession for the sites would be the replacement of the aspen with conifer or sagebrush/grass vegetation.

Past Activities:

The entire study area is grazed by livestock and has been for well over eighty years. Nineteen grazing allotments are located within the West Fork/Antelope Basin area. Currently all allotments are under an approved allotment management plan, which may be reviewed at the District office. Most of the allotments are under a deferred or rest rotation grazing system, many of which have been in place for over twenty years. The West fork and Antelope Basin areas provide forage for 4717 cow/calf pairs, 40 horses and 6700 ewe/lambs for a total of 25,169 AUM's. See the Livestock Management section of this chapter for more detail.

From 1959 to 1980 a very aggressive program of Sagebrush and Wyethia control was undertaken in the West Fork and Antelope Basin areas. During this time 21,168 acres, or approximately 50%, of the Sagebrush type and 5,520 acres of Wyethia were treated. Many of these acres were treated more than once. The majority of the Sagebrush was treated in the late 60's and early 70's. The Wyethia was treated mainly from the mid 70's to the early 80's. At the time of treatment Sagebrush canopy cover was quite heavy. No measurements were taken prior to spraying but study plot photos show canopy coverage that would generally measure from 20-30%. The spray used was 2,4-D mixed in a diesel carrier. Post treatment surveys generally showed 90% + kill on the Sagebrush. The objective of both the sagebrush and wyethia treatments was the eradication of both target species within the treatment area. The Sagebrush was unwanted due to its' competition with desirable forage species. Wyethia control was done for watershed protection reasons. After treatment a very large increase in forage production occurred. Very little detailed measurements of the forage increase were completed after the spray projects. From reviewing the studies done and field notes after the projects, increases in production averaged approximately 1.4 times pre-treatment; three years after spraying. Even with the increased forage production no increases in stocking occurred.

From 1982 to 1988 a Sagebrush burning program has been in operation in the West Fork and Antelope Basin area. A total of 6491 acres were burned during this time. The majority of the burned acres(4397) are in Antelope Basin . The burning program was initiated due to the return of Sagebrush back to pre-spray densities. Management goals for the prescribed burns were to reduce Sagebrush density by approximately 60%. Prescriptions were written to produce a mosaic of burned and unburned sagebrush within a unit. Measurements of pre and post burn forage production show a 2.0 - 4.0 times increase; two to three years after treatment. Again increases in forage production were not used to increase stocking on any of the grazing allotments.

To date very little control work has been undertaken to limit the conifer encroachment into the sagebrush/grass vegetation. Less than forty acres have been treated to set back the establishment of conifers. This treatment was in conjunction with past sagebrush control efforts and have been confined to the narrow ecotone between conifer stands and open sagebrush/grass.

Until recently aspen treatment was completed in the same manner as conifer encroachment, in conjunction with prescribed fires for sagebrush control. Only a limited number of stand where treated and generally only the edge of the stand was affected. Overall from 1982 to 1988 fewer than fifty acres of aspen where treated. Aspen response in these areas has been good. In 1989 field surveys were started to collect data on aspen stand conditions. Stands were evaluated and a program begun to treat the more decadent stands. Stands were manually treated by cutting down all mature live trees in a stand. Since 1989, 165 acres have been treated in this manner. All stands have been within the Antelope Basin area. Initial results have shown good sprouting of the aspen.

Existing Condition:

Vegetation conditions within the study area are generally good with static or upward trend. Condition and trend is measured by a variety of methods. The most extensive information available on the areas vegetation is from older Range Analysis data that is based more on forage value for livestock. This data were collected from permanently located Parker Three Step transects, paced transects and ocular reconnaissance. Habitat type classification and mapping is more reflective of site potential than the older range data. Current mapping and analysis is based on this principle. Data collected using the "Ecodata" sampling method provides a variety of sampling intensities from permanently located nested frequency plots for condition and trend studies to subjectively located ocular plots for vegetation description. Some habitat type mapping has been completed in the area.

Ecodata sampling has indicated that much of the Sagebrush/grass type in the study area is in a mid to late seral condition. Approximately half of the sagebrush/grass vegetation in the study area has had some type of sagebrush control work done in the last 20 to 30 years. 78% of the type never had or has had no cultural treatment in over 20 years. 16% has been treated in the last ten years, this reflects 6491 acres of prescribed burns. Sagebrush has reestablished following the major spray projects of the 60's and 70's. Canopy cover in many areas is back to pre-spray levels. The canopy cover of the Sagebrush in these areas currently range from 15% to 25%. In some of the areas sagebrush appears to be in such density that forage productivity and landscape diversity is less than desirable. Sagebrush stands with a canopy cover of 15% can make hiking in the area awkward, canopy cover of 20% to 30% make movement thru the area very difficult. Canopy covers for the sagebrush/grass type in the West Fork/Antelope Basin area are summarized in the preceding landscape diversity discussion.

Aspen is found scattered throughout the study area. Stands range in size from small half acre clones to large 10-20 acre stands. The condition of the aspen in the area is quite varied. Some factors affecting the Aspen are the general stand age averaging 50 years, natural vegetation succession to conifer dominance and livestock/wildlife utilization. Aspen is maintained on many sites by natural catastrophic events such as fire. In the absence of such events the natural succession for the sites would be the replacement of the aspen with conifer or sagebrush/grass vegetation. Aerial photo interpretation from 1947 to 1987 show a large reduction(40%-50%) in the amount of aspen in the two areas. Field surveys completed in Antelope Basin in 1989 show one half of the 258 acres sampled in jeopardy of dying out in the near future. Stands had no substantial or healthy regeneration and nearly all had some conifer encroachment. Field reconnaissance in the West Fork suggest similar conditions.

In reviewing old photos and field observations it is evident that in the West Fork/Antelope Basin area the ecotone between the forest and sagebrush/grass vegetation types has expanded. Conifers, mainly Douglas Fir, have become established in the Sagebrush/grass type. The potential habitat type of these areas would be Douglas Fir/Pinegrass (Pfister and others 1977). Generally the suppression of natural fires over the years has allowed the conifers to establish. If allowed to proceed toward the potential climax, without fire, the sites would develop into a fairly dense stand of Douglas Fir pushing out the Sagebrush/grass vegetation that is currently occupying the site. If a wildfire of any size would burn through the stand the site would revert back to an open grassland or park-like stand of scattered Douglas Fir (Fischer and Clayton 1983).

The current overall vegetative makeup of the area with large expanses of dense sagebrush, decadent aspen and conifer encroachment can be attributed partially to the lack of natural fire. Research done in southwest Montana and Yellowstone National Park(Arno & Gruell 1983, Arno & Gruell 1986, Gruell 1983, Houston 1973) suggest a natural fire occurrence of 20 to 45 years. Much of this research was conducted in timbered areas, the fire frequency in the adjacent sagebrush/grass vegetation may have been even shorter. The frequent fires would have caused the area to be dominated by open grasslands with sagebrush and conifers confined to drier, rocky sites which do not produce sufficient fine fuels to carry fire. As noted by Arno and Gruell (1986) "Early narratives cite extensive, smooth grasslands in the Monida Pass and Henrys Lake-Raynold Pass areas, whereas today dense stands of sagebrush are prominent there."

Current and past fire suppression activities have allowed succession to progress uninhibited. Sagebrush cover has increased in the area and conifers have moved out into the open sagebrush/grass vegetation. Given time, with the absence of fire, the sagebrush canopy will close. As the canopy cover increases grass and forb vigor will decline along with forage production (Tisdale and others 1969) It has been theorized that if these dense sagebrush stands remain untouched by fire they would naturally break up and produce a mosaic of small opening and dense shrubs (Wambolt, personnel communication). As the sagebrush canopy opens, grass and forb vigor and production may return. No research has been completed to suggest a time frame for this undisturbed natural progression.

Studies on sagebrush control using fire and herbicides show a 30 and 15 year life, respectively, of the different treatments (Harniss and Murray 1973, Johnson 1969, Wambolt and Payne 1986). Most studies were conducted to measure the affect of the sagebrush treatment over time. Treatments were planned to maximize the reduction of sagebrush and increase forage production. Harniss and Murray (1973) show a very slow increase in sagebrush and a large increase in grasses and forbs for the first twelve years after the burn. The next 18 years show a substantial increase in sagebrush and a reduction in the grass/forb components. The sites treated with herbicides showed a similar progression but at a faster rate.

The results of these studies and the vegetative succession after sagebrush treatment on the Madison District show similar trends. For the first five to ten years after sagebrush treatment the sagebrush density is fairly low, 5%-10% canopy cover. Grass and forb vigor and production would be high. The general appearance of the site would be of an open grassland with scattered sagebrush.

The following photograph represents the appearance of an area up to 10 years following treatment.

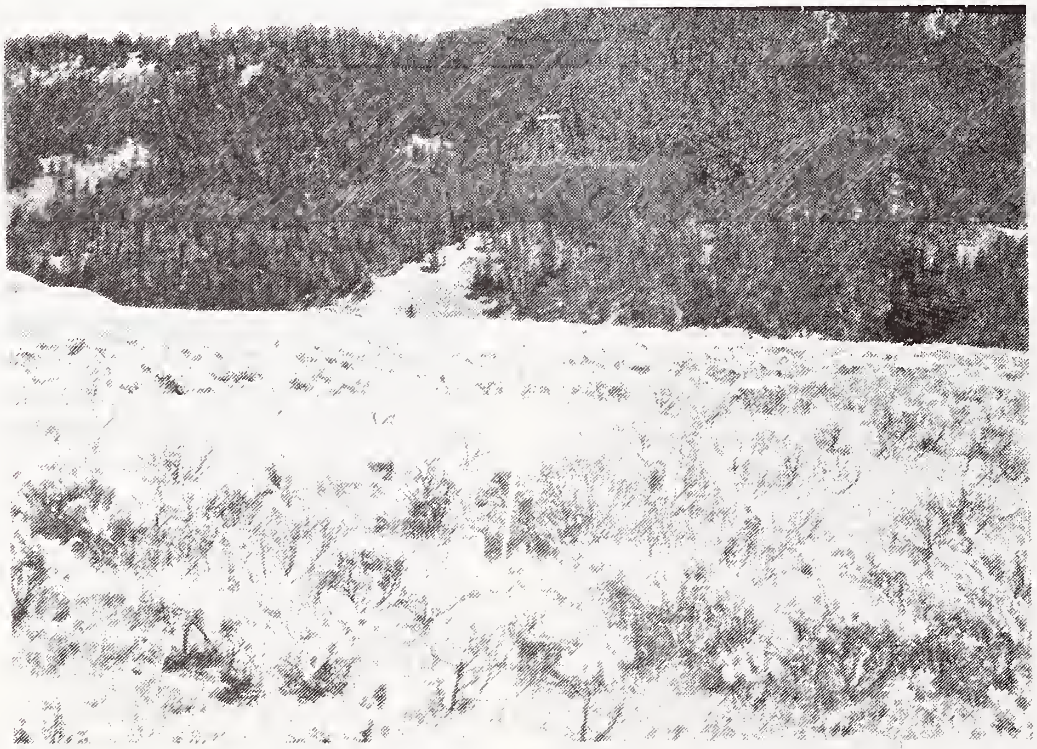


Photo 1.
Burn unit in the lower West Fork area two years after treatment.

In the next five to ten years, 11 to 20 year after treatment, the sagebrush density shows a substantial increase. Sagebrush canopy would be filling, grass and forb production would peak and start to decline due to the increased canopy cover of sagebrush. Canopy cover would range from 10% to 15%. The area would appear as a sagebrush dominated site with pockets of grasses and forbs scattered throughout.

The following photograph represents the appearance of an area 11 to 20 years after treatment.

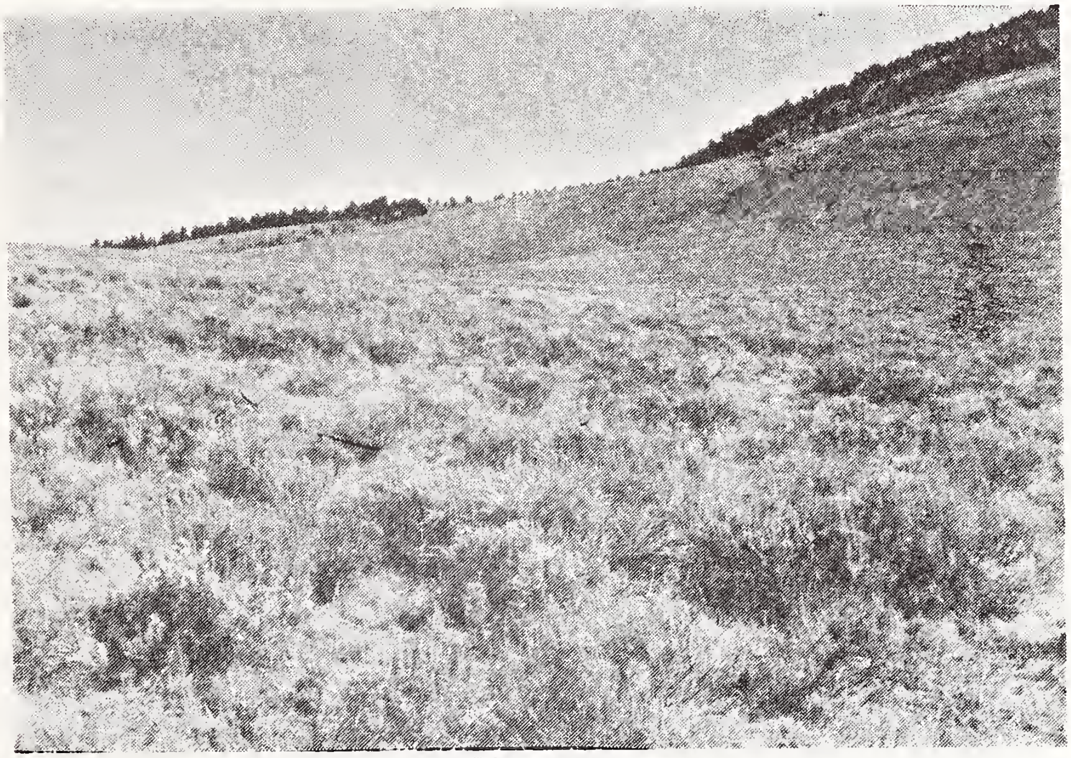


Photo 2.
Burn unit near Elk Lake treated in late 1960's.

As the site gets 20 to 30 years past treatment the sagebrush will become dense and be similar in appearance to pre-treatment conditions. Sagebrush canopy cover will range from 15% to 20%. Grass and forb vigor and production will be lower due to the competition with the sagebrush. The overall look of the site will be of a fairly dense stand of sagebrush with only small pockets of grasses and forbs.

The following photographs represent the appearance of an area before treatment and 20 to 30 years after treatment. These photos were taken from the same point within a study plot.

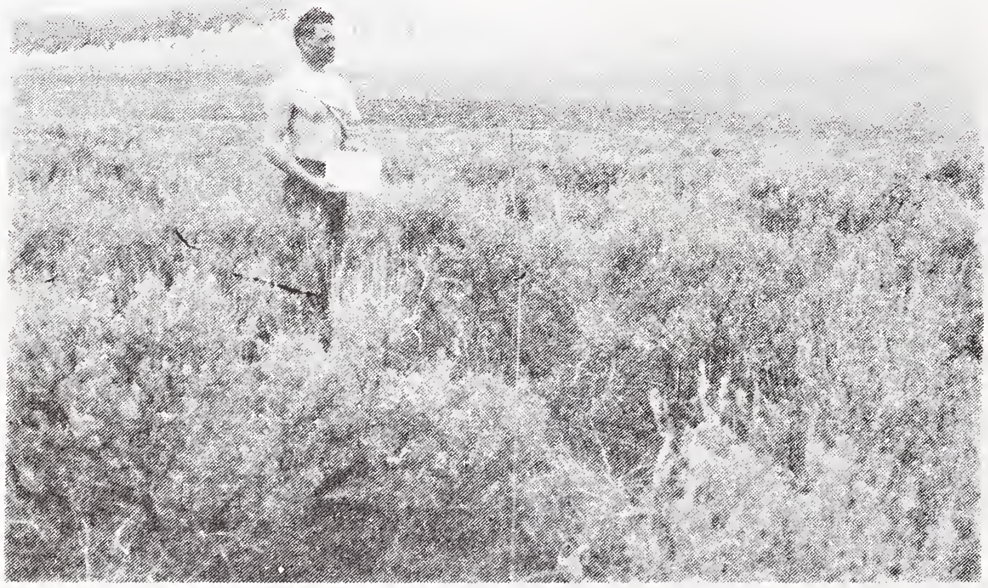


Photo 3a.
1959 photo of area in Upper West Fork immediately prior to treatment. The treatment accomplished approximately 90% kill on the sagebrush.

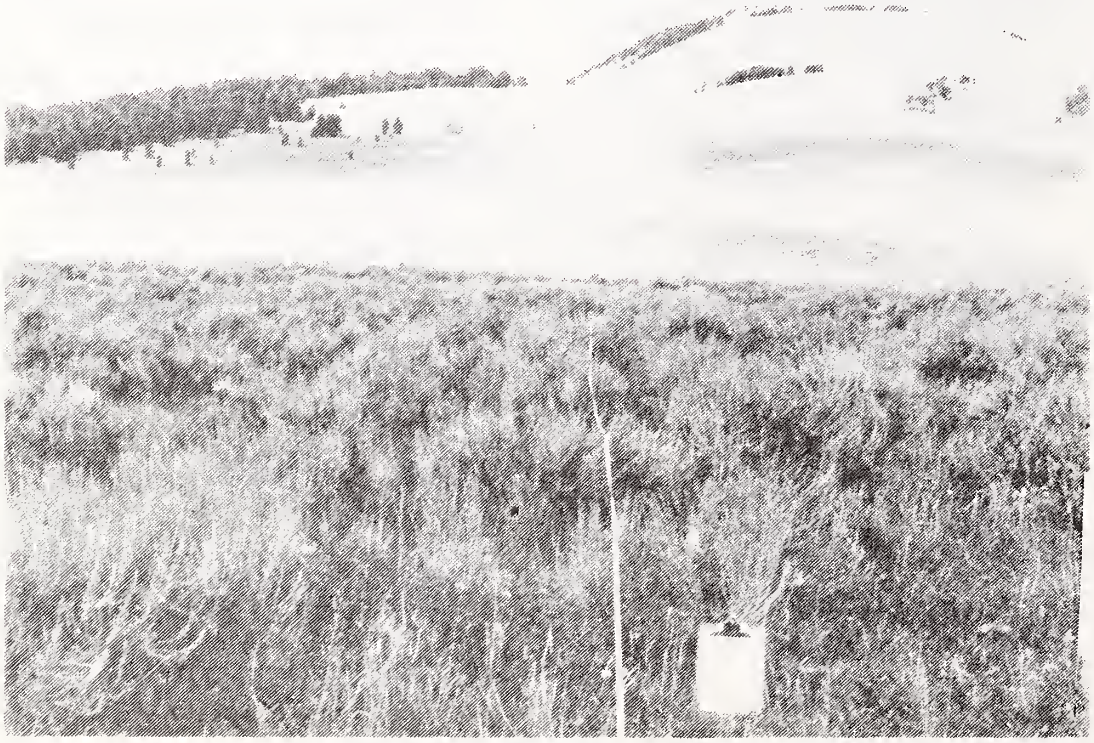


Photo 3b
1988 photo of same area approximately 29 years after treatment.

Threatened, Endangered and Sensitive Plants:

Twenty three species of sensitive plants are known or suspected to occur in the Beaverhead National Forest (USDA undated, USDA 1989, Zook personal communication 1988). Three species have been found within the West Fork/Antelope Basin area. Keeled Bladderpod, *Lesquerella carinata*, and Wolf's Willow, *Salix wolfii var. wolfii*, have been found in the study area but both sites are well distant from any proposed burn units. A very small population of Yellow Springbeauty, *Claytonia lanceolata var. flava*, was found this spring in a Sagebrush/grass community. The site has a high occurance of Silver Sagebrush and has been eliminated from the burn proposal. Sensitive plant surveys are continuing in the study area. General habitat, location and status are:

Yellow Springbeauty, *Claytonia lanceolata var. flava* occurs in moist, mid to high elevation montane meadows from 5,500 to 10,000 feet. The population found in the spring of 1990 is located near a small saddle between Moss and Tepee creeks. Other populations known in the state are from Deerlodge, Gallatin and northern Beaverhead counties. It is classified as "sensitive" by the Northern Region, and has a "C2" status with the U.S. Fish and Wildlife Service. C2 or Category 2 status means current information indicates that proposing to list as endangered or threatened in possibly appropriate, but substantial biological information is not on file to support an immediate ruling.

Keeled Bladderpod, *Lesquerella carinata* occurs on bare soil in grasslands and other open habitats, often in calcareous areas from 4,500 to 9,500 feet. The known population in the study area is located on the summit of an unnamed peak in the Centennial mountains. Due to the condition of the specimen from this population its' identification is currently uncertain. Other populations known in the state are from Granite county. It is classified as "sensitive" by the Northern Region, and has a "3C" status with the U.S. Fish and Wildlife Service. A 3C status means that the species have proven to be more abundant or widespread than was previously believed, and/or those that are not subject to any identifiable threat.

Wolf's Willow, *Salix wolfii var. wolfii* occurs along streambanks and in wet meadows from 8,000 to 9,000 feet. The population located within the study area is located southeast of Black Butte. Other populations in the state are found in Deerlodge county. It is classified as "sensitive" by the Northern Region, and has no status with the U.S. Fish and Wildlife Service.

Of the remaining sensitive plants, a review of the various habitats, as well as a review of occurrence reports eliminated all but five species from possibly occurring in the study area. Two species of this group may occur in Sagebrush/grasslands, the targeted habitat of the proposed project. These species are:

Jackson's Hole Thistle, *Cirsium subniveum* occurs in Sagebrush/grasslands and meadows from 6,000 to 8,000 feet. It has been identified just south of the project area in the Centennial Valley. It is classified as "sensitive" by the Northern Region, and has no status with the U.S. Fish and Wildlife Service.

Jove's Buttercup, *Ranunculus jovis* occurs in Sagebrush/grasslands to forested slopes from 7,500 to 9,500 feet. Jove's Buttercup has been found in the Centennial Mountains south of the project area. It is classified as "sensitive" by the Northern Region, and has no status with the U.S. Fish and Wildlife Service.

The three other species that may occur in the study area generally occur in moist meadows to swampy or boggy soils which should not be found in any of the proposed treatment sites. These three species are:

Showy Pussytoes, *Antennaria pulcherrima* occurs on hummocks, and around shrubs, in swampy or boggy soils from 4,000 to 7,000 feet. It has been identified in the Centennial Valley south of the project area. It is classified as "sensitive" by the Northern Region, and has no status with the U.S. Fish and Wildlife Service.

Idaho Sedge, *Carex idahoa* occurs in wet meadow in regions of calcarious parent material from 6,500 to 8,500 feet. Idaho Sedge has been identified in mountainous areas southwest of the project area.

It is classified as "sensitive" by the Northern Region, and has a "3C" status with the U.S. Fish and Wildlife Service.

Alpine Meadowrue, *Thalictrum alpinum* occurs on hummocks beneath low shrubs in moist, alkaline meadows from 6,500 to 7,000 feet. It has been found in the Centennial Valley southwest of the project area. It is classified as "sensitive" by the Northern Region, and has no status with the U.S. Fish and Wildlife Service.

Water and Fish:

Affected Area:

Portions of three watersheds comprise the affected area for these resources. The West Fork of the Madison River is the major tributary of the Madison below Hebgen Lake, draining an area of approximately 225 sq. mi. of the Gravelly Range. Antelope Creek (approximately 20 sq. mi.) is located to the southeast of the West Fork, and is a major tributary of Cliff Lake. Elk Creek (approximately 13 sq. mi.) is located to the south of the West Fork, and flows directly into Upper Red Rocks Lake.

Each of these drainages is part of a different major basin. The West Fork enters the Madison River, which is a major tributary of the Missouri, about 120 miles downstream. Elk Creek is also in the Missouri system, but reaches Three Forks through the Red Rocks, Beaverhead and Jefferson Rivers, about 300 miles downstream. Cliff Lake, the receiving water for Antelope Creek, has no surface outlet. It is, in effect, a closed basin. Due to the fact that the waters of these drainages do not confluence until many miles downstream from the project area, and in the case of Cliff Lake not at all, a cumulative effects assessment in terms of water and fish for the entire project area is not possible or warranted. An assessment of effects at the mouth of the respective drainages will provide an adequate picture of the situation.

The Preliminary Project Analysis and Study Plan for the West Fork Barometer Watershed (USDA, 1966) provides an excellent view of the physiography and climate of the West Fork. The drainages are typical of high elevation watersheds in the West, where streamflows are low and relatively constant during much of the year. Peak runoff periods occur in response to snowmelt in May and June, and during these times it is common for stream discharges to increase tenfold.

Most stream channels are stable, and reflect the geologic variability and climate of the area. An exception is the main channel of the West Fork, which has unstable banks along most of its length. It is a high sediment producer, and contributes a large concentration of fines annually to the Madison river. A major source of this fine material is a number of high river terraces of alluvial origin downstream of Teepee Creek (USDA, 1966). Lisle (1972) calculated that 98% of the total sediment load of the West Fork was suspended sediment, and of that load, 47% was from lateral erosion of the streambanks.

A portion of the project area is located on the foothills adjacent to the mainstem of the West Fork. Much of this area is made up of river terraces, depositional features that were formed during previous geologic eras. Drainage density on these features is relatively high, as is delivery potential to the West Fork. In Antelope Creek, most of the possible burning sites are on the uplands, and delivery potential to streams is low.

Past Management:

Prior to the early 1960's, the predominant management activity in the proposed project area has been livestock grazing. Early grazing placed little emphasis on resource protection, and as a consequence many areas in the drainage were overgrazed. The effects of this activity are still evident on the upper slopes and in many of the drainages. Early sheep grazing in the upper portion of the West Fork led to soil compaction and surface erosion. Lisle (1972) concludes that this effect is the cause of current channel widening in the West Fork. General overgrazing by cattle and sheep was responsible for the decline of forage and the general vigor of the plant community. Cattle use along the riparian zone of the West Fork contributed to bank instability and sediment production (USDA, 1966).

In the early 1960's, more intensive livestock management was instituted. Sheep allotments in the upper watershed were combined, permitted numbers were reduced, and more intensive management systems initiated. On cattle allotments, permitted numbers were reduced, seasons shortened, and rest-rotation and deferred rotation systems initiated. The spraying of sagebrush provided additional forage (USDA, 1966). The net result of these changes was to improve watershed conditions throughout the drainage to a level that they are maintained at today.

Roadless Areas:

Affected Area:

The roadless area that will be affected by the proposed action is the 95,098 acre Freezeout Mountain area 1-029. This area is described in Appendix C to the Forest Plan on pages C-404 thru C-420.

The Forest Plan established Forest-Wide multiple use goals, objectives and management area requirements as well as management area prescriptions. The analysis of roadless lands, documented in Appendix C, described each roadless area, the resources and values considered, the range of alternative land uses studied, and the effects of management under each alternative. As a result of the analysis, some roadless areas were recommended for inclusion in the National Wilderness Preservation System and others were assigned various non-wilderness management prescriptions. The Freezeout Mountain Roadless Area was assigned to Management Areas: 1, 14, 16, 20, 21, 24, and 25.

These Management Areas contain a mix of resource management emphases. The following table is a comparison of the acres and percent of the roadless area in a specific emphasis. See Appendix C, page C-412.

Table III-3. Roadless Area Management Emphasis.

EMPHASIS	ACRES	% OF ROADLESS AREA
Timber	4,354	4 %
Recreation/Custodial	29,088	31 %
Range and Wildlife	61,656	65 %

There are two separate units of the Freezeout area. The 65,794 acre unit 1-029A is located on the east slopes of the southern portion of the Gravelly Range. It contains the West Fork of the Madison and Elk River Drainages. The Elk River area is characterized by deep canyons and steep rocky sideslopes. The West Fork of the Madison drainage in the south is characterized by rolling foothills and long, moderately steep sideslopes. The dominant terrain feature in this area is 10,171' Lion Mountain near the north boundary. The northwestern and south central portions are generally forested with the major species being lodgepole pine, Douglas-fir, and Englemann spruce. The southwestern portion is more open with approximately two thirds of the area being grassland or sagebrush/grassland communities and the remaining third being forested.

The 29,304 acre unit 1-029B is located southwest of 1-029A in the Antelope Basin area. Elk and Hidden Lakes and the southern portion of Cliff Lake lie within this unit. The terrain is characterized by large, gently sloping benches except for a deep, steep-sided rocky canyon that contains Hidden and Cliff lakes. Vegetation on the benches is approximately half forested and half grassland parks. The forested areas are primarily lodgepole pine and Douglas-fir. On the north slopes at mid elevation ranges, the vegetation is primarily grassland and sagebrush/grassland interspersed with patches and stands of Douglas-fir and aspen. The Cliff Lake Research Natural Area, designated in May, 1952, is located in the north portion of 1-029B.

Unit 1-029A is separated from other roadless areas in the Gravellies by the Gravelly Range

Road on the west boundary and the Standard Creek road on the north boundary. Unit 1-029A is also separated from 1-029B by a corridor 1 1/2 to 3 miles wide from Hoodoo Pass to Wade Lake. See Roadless Area Map on page C-404 of Appendix C to the Forest Plan.

Because these units are isolated from each other and from other roadless areas by developments, they will be treated as separate and distinct units for purposes of this analysis and the assessment of direct, indirect, and cumulative effects.

Past Management:

At the time of the 1977 RARE II inventory, area 1-029 contained 98,860 acres. Between 1977 and completion of the Forest Plan in 1986, timber sale and road construction removed 2810 acres from the roadless area to the north and west of Hoodoo Pass. An additional 952 acres were removed due to general acreage recalculations. The net result of these changes was the separation of the initial area into the A and B units being discussed in this document and the reduction in size to 95,098 acres. See Appendix C, page C-407.

Past management of these roadless areas emphasized grazing, wildlife, and recreation values. Many facilities were constructed to support these uses. On grazing allotments, many miles of fencing and numerous water developments are in place to help manage the livestock. In the late 1960's and early 70's, approximately 15,500 acres of sagebrush were sprayed to enhance grass and forb production to benefit livestock and big game. An additional 5,400 acres of sagebrush were burned. Approximately 200 acres of aspen were treated to rejuvenate the stands and enhance wildlife habitat. There are also two cabins used by stockmen. A network of trails was developed to provide recreation and administrative access. There are also many miles of old "wheel track" roads crossing the area. In 1952, the Cliff Lake Research Natural Area was designated.

Off-road vehicle travel has been strictly managed in 1-029. Except for specific areas where snowmobiles are permitted to travel cross country, the majority of the area is closed to motor vehicles except on designated roads or trails. See 1990 Interagency Visitor Map.

Since the execution of the Forest Plan in 1986, several "wilderness bills" have been proposed by the Montana congressional delegation. To date, none of these bills have proposed that the Freezeout Mountain area be added to the Wilderness system.

Existing Condition:

The existing condition of the area will be discussed thru 7 elements that comprise the roadless characteristics and wilderness features. These elements are; natural integrity, apparent naturalness, remoteness, solitude, special features, manageability, and special places and values. Detailed definitions of these elements are found in the Glossary.

The information summarized and presented in the following descriptions of the existing condition was gathered from Appendix C, and from correspondence and discussions with interested participants. Specific documentation of correspondence, conversations, and reviews are found in the project file.

Natural Integrity

Natural integrity is a measure of the extent to which natural processes are intact and operating. Management activities can impact the natural integrity of the area by altering such things as vegetation succession and watershed or fisheries conditions.

Much of 1-029A and nearly all of 1-029B are being managed under intensive rest rotation grazing systems. There are four sheep and eight cattle allotments grazed by approximately 3000 sheep and 8000 cattle. The natural vegetative succession has been interrupted and the natural integrity has been heavily impacted by the history of grazing, fire suppression, and treatment of the vegetation by spraying and burning. The fences, water developments, driveways, cabins etc have also introduced man made elements that detract from the natural integrity.

Apparent Naturalness

Apparent naturalness is a feeling of whether the area "looks" natural to most people who use it. The overall appearance of areas A and B is quite natural. The ranges are in good condition and the presence of livestock in an area is not an unexpected sight. The presence of fences, water developments, trails, stockmen's cabins, and wheel track roads are not viewed as significant intrusions by most viewers to the area. Again, they are expected elements of the setting.

Remoteness

Remoteness is a feeling of being secluded and out of the way. Access into both areas A and B is relatively easy. There are many trails accessing the interior and several are open for use by motorized vehicles. In area 1-029B, the existence of many wheel track roads further increases the ease of access. The more gently rolling nature of much of the terrain and the large areas of open sagebrush and grassland communities also detract from the feelings of seclusion. In general, the area offers minimal opportunities for experiencing a truly remote setting.

Solitude

The feeling of solitude is a very personal value related to isolation from the sights, sounds, presence of others, and developments of man. Solitude differs from remoteness in that it incorporates more of the human contact and personal challenge aspects into the setting.

The best opportunities for solitude are generally found in primitive and semi-primitive non-motorized classes of the Recreation Opportunity Spectrum (ROS). It is in these classes that an individual may find the best opportunity for personal challenges and the exercise of woodsman skills while out of contact with other people.

Recreation use has been heavy with approximately 4700 visitor days of use reported during the analysis of roadless areas in the Forest Plan. See Appendix C, page C-407.

With easy access, generally open terrain, and relatively high use statistics, the opportunities for finding areas that offer individual challenges in a setting where one feels isolated from other human contact are poor. In addition, an individual would seldom be far removed from the trails, roads, and livestock developments.

Special Features

Unit 1-029A contains Elk River which is currently under study as a potential addition to the National Wild and Scenic River System. The initial eligibility of Elk River was based on a survey of its wild characteristics. The status of the river is pending completion of the study and submission of a final recommendation.

Unit 1-029B contains the Cliff Lake Research Natural Area (RNA). The RNA was established in 1951 to preserve 2,301 acres of mountain grassland/timber type. The habitat types of the area specifically represented are; Douglas-fir/snowberry, Douglas-fir/Carex, subalpine fir/huckleberry, spruce/twinflower, and Idaho fescue/wheatgrass. The establishment document prohibits all types of use and occupancy detrimental to the primary purpose. No livestock grazing or timber harvest is permitted. Incidental recreation use, as well as regular protective and administrative uses are permitted.

Manageability

Manageability relates to the ability of the Forest Service to manage the roadless area to meet size criteria and the elements discussed above.

Area 1-029A, or a major portion thereof, could be managed as wilderness. The boundaries follow identifiable features for the most part and are devoid of narrow corridors or peninsulas. Impacts from motorized use of the trails could be eliminated through closures. Livestock grazing would continue and range improvements would remain a part of the setting. The Elk River road is an intrusion that would be more difficult to mitigate. Recovery of the roadbed to a natural condition or appearance would be a lengthy process. Removal of the road from the roadless area would result in either a long narrow corridor intruding into the area or a larger acreage if the boundaries were adjusted far enough back to mitigate the impact of the road on other features and characteristics. The boundary could also be adjusted to remove the 160 acres of private land shown as Shakelford Cow Camp. This again would result in either a corridor or a larger area being removed. Under any circumstances, the minimum of 5000 acres would remain in 1-029A

Area 1-029B would be very difficult to manage as wilderness. While the exterior boundary is manageable, the island of development around Antelope Basin and Conklin Lake, as well as the inclusion of private land and road access corridor would be impacts very difficult to mitigate. The impacts of many "wheel track" roads would also offer very difficult mitigation. It is not likely that the impacts of these developments could be mitigated and new boundaries established that would retain the minimum of 5000 acres necessary for wilderness designation.

Special Places and Values

Special places and values are the specific sites, places, and activities that individuals have certain "feelings" for when they visit the area. Examples might be a certain trail, a high lake, a particular camping or fishing spot etc.

There were no specific special places or values identified during the scoping and roadless analysis completed as part of the Forest Plan. Values of the roadless area were expressed on more general terms ranging from "no special qualities" to wilderness support to protect watershed, wildlife, and recreation values.

Livestock Management:

Affected Area:

The proposed action and alternatives would occur on 10 of the 19 allotments within the Antelope Basin and Westfork of the Madison Analysis Areas. Allotments on which sagebrush burning would occur are: Bufiox, West Fork, Antelope Basin, Conklin, North Saddle, Hidden Lake, Elk Lake, Elk Mountain, Red Rock, and Horn Mountain. See vicinity and allotment maps.

Past Management:

Sagebrush spraying with herbicide occurred on most of the proposed units in the late 60's and early 70's. The spray killed approximately 90% of the sagebrush resulting in a flush of grasses with forb recovery occurring a few years later. Livestock numbers were not increased following the spray projects. Rest rotation and deferred grazing systems were implemented to improve livestock management, achieve better distribution, and allow utilization of the increased forage while maintaining the vigor of the regrowth and overall site productivity.

Existing Condition:

All of the affected allotments are under intensive management systems and have approved Allotment Management Plans. The following table displays the affected allotments, management system, year of implementation, and permitted AUM's on the allotment.

Table III-4. Affected Allotment Summary.

Allotment	Management System	Year implemented	Permitted AUM's
Bufiox	Rest-Rotation (4 Pasture)	1981	1898
West Fork	Rest-Rotation (7 Pasture)	1967	8565
Antelope Basin	Rest-Rotation (4 Pasture)	1968	1518
Conklin	Rest-Rotation (4 Pasture)	1970	1758
North Saddle	Rest-Rotation (5 Pasture)	1970	809
Hidden Lake	Rest-Rotation (5 Pasture)	1974	2867
Elk Lake	Rest-Rotation (5 Pasture)	1971	1262
Elk Mountain	Deferred-Rotation (4 Pasture)	1981	560
Red Rock	Deferred-Rotation (3 Pasture)	1970	740
Horn Mtn	Deferred Entry (1 Pasture)	1982	154
		Total AUM's	20,131

All of these management systems have been successfully implemented as reflected in the overall good to excellent range conditions on the allotments. See allotment records on file at the Madison Ranger District. With the re-establishment of sagebrush in the sprayed areas, conditions are changing. As canopies begin to close, forage production is decreasing. Past research and experience has shown that measurable decreases begin to occur when canopy closure is 11% or greater. Canopy coverage on the areas proposed for burning generally range from 11-30%.

Soils and Geology:

West Fork Area

Stands of sagebrush proposed to be burned in the West Fork Madison (WF) area are contained in a belt across most of the river's basin in the southeast portion of the Gravelly Range. This belt runs from approximately the Forest boundary west of Patch Top Mountain, north to Anderson Creek, then traverses in a strip approximately 2 miles wide, and widening to more than 4 miles between Meridian Creek and Flatiron Mountain. The eastern boundary is near Jackpine Gulch.

Geologically, this band is comprised of Cretaceous and Tertiary, Permian, Missippian, Devonian, and Cambrian sediments in approximately the west half of the belt; generally getting older moving from west to east. The east half is comprised of Pre-Belt crystalline rocks in the north and Tertiary volcanics in the south end of this half.

Variation in rock types, along with the geomorphic history of the area, and the changes brought about by weathering, has produced a range of land types and soils. The land forms in the WF area primarily belong to a relatively few geomorphic process groups:

1) Structurally controlled. There are relatively few structurally controlled land types such as dipslopes and structurally controlled breaklands in the area. About half of these delineations are moderately high forage production lands, with shallow to moderately deep (25-100cm), dark colored, well-drained loam, clay loam, and silty clay loam soils.

2) Mass-wasted land types, both shallow, soil mantle failures (several to many feet thick), and a few deeper, geologic failures (10's of feet thick). Most of the latter are undulating to hilly, rocky landslides. They have very shallow (less than 25 cm deep) to moderately deep, well-drained flaggy loamy fine sands to very fine sandy loams with channery and flaggy clay loam subsoils. Most of these are now stable since their kinetic energy has been released, and they no longer have a well-defined failure plane. Most of the former have deep (100-150+cm), moderately well to somewhat poorly drained silty clay loams, silty clays, and clays. Most of these are still subject to movement

and mass-failure. Almost all delineations have productive grasslands; some have open stands of Douglas fir, limber pine, or whitebark pine with grass understory.

3) Colluvial-alluvial slopes. These land types have surficial material overlying the residual rock or soil. This material is transported and deposited by gravity and by local, unconcentrated runoff on and at the base of moderately steep or steep slopes. Most of these have grassland vegetation, and many are high forage producers. For example, land type 62B is a lower concave slope ranging from 5-20% slope, with deep, well-drained, dark colored clay loams and silty clay loams. Biomass production ranges up to 1400 lbs/ac. Land type 61B, on the other hand, is characteristically straight, 15-25% slopes, with shallow to moderately deep, well-drained, dark, channery clay loams. Biomass production ranges up to 1000 lbs/ac. Land type maps are on file at the Forest Supervisors Office.

4) Pluvial land types are those that are developed in comparatively erodible solum. They are shaped by the action of rainfall. They are characterized by a high degree of dissection, with steep side slopes, and relatively narrow ridges. Slopes range from 25-50%, with shallow to moderately deep, dark colored, channery loams and very fine sandy loams. Most of these delineations are grasslands. Their production potential varies widely by soil type (rock content, surface area, texture, mineralogy), aspect elevation. Some delineations produce only about 400 lbs/ac., others nearly 1,000.

The last major geomorphic group in the West Fork area is the frost-chruned processes. This includes the stirring, churning, modification, and other disturbances of regolity earth materials resulting from frost action. It involves frost-heaving, solifluction, differential, and mass movement, and produces patterned ground under frequent and intense freeze-thaw cycles.

In this area of relatively low elevation, land types are weakly and moderately frost-churned. For example, land type 46X range in elevation from 6500 to 8500 feet; slopes range from 10-35%; can occur on all aspects, but southerly is more common; cover types are a pattern of about 50/50 mountain grassland and stands of Douglas fir, lodgepole pine-Douglas fir, or lodgepole pine-subalpine fir. Soils are moderately deep, dark colored, well-drained loams and sandy loams; under forest canopy, soils have clay loam subsoils, and are not as dark as in the grassland soils.

6) A minor geomorphic group in the area, glacial processes, is represented by a few areas of glaciated slopes, limited moraine, and glacial troughwalls. There may have been more area affected by mountain glaciers, but the soft sedimentary base rocks do not exhibit glacial features as well as harder, crystalline rock such as granites. Also, weathering of these materials, along with post-glacial slumping, may have obliterated some glacial features.

The most extensive glacial unit of the area, relative to rangelands, and the units most likely to contain treatable stands of sagebrush, are the 21D land types. These delineations are moderately steep (20-40%), are weakly scoured with thin deposition; are weakly dissected, with moderately thick regolith. Soils are shallow to moderately deep, well-drained sandy loams, loams and clay loams in a complex pattern.

Antelope Basin Area

The Antelope Basin area, largely in the southeastern most corner of the Gravellies, is somewhat simpler both geologically and geomorphically. Most of the proposed area has prebelt crystalline rock, with a small area of Tertiary volcanics in the Narrows Creek area.

Structural land forms are far less represented within the antelope basin proposed sagebrush boundary, than in the West Fork proposed area. Land type 98C & D are the only units that occur with any frequency. With timber cover on 98C's and slopes up to 70% on 98D's, little if any sagebrush would likely be burned on these units.

Mass wasting land types are also far less frequent in the Antelope Basin proposed area. Soils that weather in the pre-Belt Group rocks do not contain the secondary soil minerals that are susceptible to mass-failure/shear plane development.

Most of the area within the proposed boundary is comprised of colluvial-alluvial and frost-churned land types as described under the West Fork area. Types that are more common in the Antelope Basin boundary are alluvial fans and stream terraces. A typical alluvial fan land type in this area would be 64B. This mapping unit is mostly gently sloping (5-15%), weakly dissected, and broad, with thick regolith. They are predominantly grassland, with shallow, well-drained, gravelly loams and sandy loams. Productivity usually does not equal the more productive colluvial-alluvial slopes, or some of the weakly frost-churned types.

A typical stream terrace from the area can be represented by land type 66B. The unit is nearly level (0-5%), and has thick regolith. There is mostly grassland cover; soils are shallow, well-drained, gravelly sandy loams and loams. They are slightly more productive than the fans.

Air Quality:

Affected Area:

The entire project is located within Airshed 7 as defined by the Montana Airshed Group. The boundaries of Airshed 7 include Beaverhead, Madison, and the southern third of Jefferson Counties.

Past Management:

There have been no violations of air quality standards in the project area. Past wildfires and prescribed burns have occasionally caused local air quality deterioration.

Existing Condition:

There are no industrial or agricultural sources of air pollution that affect the project area. The ambient air quality is rated good to excellent. Wind power in the project area is given a rating of 6, the highest in the state. This rating projects wind speeds to average approximately 16 mph, assuring adequate mixing and dispersion of potential pollutants (Elliot et. al., U.S. Department of Energy.)

CHAPTER IV

Environmental Consequences

CHAPTER 4 --- ENVIRONMENTAL CONSEQUENCES

Introduction:

This chapter provides an issue by issue disclosure of the environmental effects of implementing the alternatives. The significant issues and indices of measure are the primary focus of the discussions. Effects which may not be linked to the significant issues are also presented when they lend substance to the discussions and assist the decision maker in arriving at a decision.

All action alternatives are varying schedules of burning, therefore, the effects are very similar in kind but vary in degree. Discussions in this chapter focus on the most significant effects while other effects are described briefly. The descriptions of existing conditions presented in Chapter III provide the baseline for discussion of effects. Direct, indirect, and cumulative effects will be discussed. Cumulative effects will discuss the effects of individual alternatives in combination with the effects of past, present, and reasonably forseeable actions.

Environmental Consequences:

Wildlife:

Effects Common to all Action Alternatives:

All of the effects summarized in this Effects Common section are discussed in more specific detail in the wildlife analysis enclosed in the project file.

Big Game:

Moose populations will not be adversely or positively affected to any measureable degree. They will continue to use the burned areas. The regeneration of aspen and the browse it provides will be a positive benefit.

Non-game and Small-game species:

Both ruffed and blue grouse will benefit from the burning. Ruffed grouse will respond positively to the diverse age classes that will be established in the aspen stands. They generally need a diversity of ages classes in close proximity to satisfy all habitat needs. Blue grouse will find the burned areas near timber stands as good feeding areas due to the increases in forbs that will result.

Burning of sagebrush will have no detrimental effect on either the ruffed or blue grouse. Ruffed grouse could be adversely affected if the treated aspen stands fail to regenerate.

Management Indicator Species:

Elk:

None of the area covered in this analysis is key winter range therefore, none of the alternatives will adversely impact wintering elk.

The potential cumulative impacts on elk were analyzed for the Gravelly Elk Management Unit. Factors considered were the effects of the individual alternatives, the other ongoing management activities in the area, and the potential of approximately 200-250 acres of additional sagebrush burning per year for the next five years on nearby private lands. None of the alternatives in combination with other ongoing management activities or the potential of an additional 200-250 acres of sagebrush burning per year on nearby private lands will likely alter populations or the health of the elk herds into the forseeable future.

Pine Marten:

None of the action alternatives will impact pine marten habitats.

Sage Grouse:

Cumulative impacts of prescribed burns on adjacent sagebrush stands in and near the Gravellies have the potential of reducing sage grouse populations as a whole. The most critical areas, namely the breeding areas and the winter range, are located outside Forest Service control. Activities in these critical areas could further reduce numbers of grouse that are sometimes found within the analysis area. Grouse are not likely to move from another area to the analysis area if some habitat alteration takes place. Grouse are very traditional in their use and will either survive or die out in their traditional summer and winter ranges. Therefore, the impacts of the alternatives, such as they are, effect the local population only, with little cumulative impact beyond the Gravellies.

Goshawk:

None of the action alternatves will impact old growth Douglas fir stands. While goshawks are predominantly forest birds, they will occassionally hunt the edges of open meadows to take advantage of prey species such as ground squirrels (Shuster 1977). Goshawks will also nest in mature aspen and use the older trees for hunting perches. If the aspen stands that are burned are not allowed to progress back to older ages, the nesting and perching habitat they provide would gradually be eliminated. This impact will be mitigated by buffering the regenerated stands against future burning until the trees have advanced into older age classes.

Trumpeter Swan:

This species is not likely to be effected by the burning except for the year that the Elk Lake Unit #5, Conklin Pothole Unit #4 and theConklin Sheepfield Unit #3 are burned. These units are directly west of the Conklin and Elk lake swan nests and approach to within 300 yards of the nests. Burning from late March through May would be during the time the swans are establishing their nest or are on eggs. This would be their most critical time period where they are most likely to abandon the nest. A disturbance such as a fire, while short in duration (probably one but possibly two days) could be enough to cause abandonment of the nest. Consultation with biologists at Red Rock Refuge concurs with this opinion that these burns could jeopardize these nests (Gilbertson 1990 personnel commun.).

Scheduling these units for a fall burn will mitigate the potential impact on the nesting swans. None of the other units, whether burned in the spring or fall, will have any impact on the swans.

Sensitive Species:

Boreal owl, harlequin duck, spotted bat, and Western big-eared bat:

It is expected that none of the action alternatives will have any impacts on these species.

Ferruginous hawk:

Ferruginous hawks are very susceptible to abandonment if disturbed even minutely during egg laying and incubation (Olendorff 1973). Snow (1974) states "With the increasing demand on public lands for resource development and recreation, human activity in areas with nesting populations of ferruginous hawks may become a severe limiting factor if such activity occurs during the period before the young hawks are hatched. This will mean a loss of habitat for ferruginous hawks even if the actual land is itself left intact and not altered during development."

A prescribe burn within sight of the nest could easily cause desertion. Howard and Powers (1973) and Smith and Murphy (1973) all verify this tendency to abandon nests even from one visit by researchers from a distance.

Snow (1974) recommended limiting or prohibiting human access to within 300 yards of the nests during the incubation period which runs from mid March through mid May.

Ferruginous hawk could be impacted by the alternatives through disturbance during nesting. The units at the upper end of the West Fork Madison River west of Cascade Creek would be the most likely to contain nests although no nest sites have been recorded. These units are listed as a spring or fall burn. If a fall burn, the impacts would be limited to the burning of nest trees, something that could be easily mitigated once the nests are located. If the units are not burned in the spring and assuming the nest trees can be saved from burning, it will still be important to assure the 40-60% mosaic in the individual burn units is not exceeded. Excessive burning will reduce habitat for cottontails and jackrabbits which in turn reduces suitability of the areas for ferruginous hawks.

With the burning planned and ongoing in the Centennials, the cumulative impacts on ferruginous hawks could become significant. Unmitigated burning could result in abandonment of a considerable percentage of the hawks' nests which could ultimately threaten the area's population. The important habitat need is for large sagebrush stands undisturbed during the spring with healthy rabbit populations. Some of the burns on private land may be done without consideration of the needs of this bird. This could make the south Gravellies habitat increasingly more important. Mitigation measures as described become even more important.

Threatened and Endangered Species:

The discussions presented here and in following sections of this chapter are substantiated in more detail in the Biological Evaluation attached as Appendix B of this document.

Grizzly bear, peregrine falcon, and grey wolf:

These three species are not likely to be affected by any of the action alternatives. Use of the vicinity, particularly the sagebrush areas is slight. There are also no significant reductions of the prey base predicted which could impact them indirectly.

Bald eagle:

There is an active bald eagle nest site located on the east side of Elk Lake approximately 1/2 mile from the burn units west of the lake. Smoke from a spring burn of Elk Lake Unit #5 would likely drift towards the nest and could result in abandonment by the eagles.

There are several ways in which to mitigate this affect. The easiest would be to move the burn to the fall or at least late enough in the spring so as to be after egg hatching. In 1990, the estimated egg hatching date was between May 7-14. This was the first year this nest was successful in recent years. If the nest is abandoned, then the burn could go on as scheduled with no impact to the eagles.

Other than this one unit, the alternatives will have no impact on the bald eagle. The nesting eagles made most of their prey captures in the lake or associated riparian. When they did hunt over land, it was to the east, in the 1986 burn unit where approximately 80% of the sage was killed. For this reason, the burn units proposed, excepting the above unit, would not be an impact.

Direct and Indirect Effects by Alternative:

Alternative 1 - No Action:

If no prescribe burns take place, a number of consequences can be predicted to occur in the next several decades.

As sagebrush stands reach maturity, vegetative characteristics will shift towards a higher canopy density and a corresponding decrease in grasses and forbs. There has been speculation that past maturity, these stands will then start to open up as the older sage dies, thus allowing grasses to increase and young sage to grow in these openings. Under this theory, vertical diversity would then become quite high, with several ages of sagebrush and grasses growing closely together. Extrapolating further, this condition could continue indefinitely. Only speculation is involved since there is no documentation showing when this breaking up of the mature stand would occur or if it in fact would happen. For the purposes of this document however, the following are the wildlife responses to this shift from present condition to maturity and finally to this uneven age sage condition.

Big Game:

Big game species will not likely increase or decrease in population because of habitat changes in the summer range. Their population is much more sensitive to hunting seasons and winter range conditions. There may be some local movement of animals with the change in vegetation however. For example, bedded or stationary mule deer will be less vulnerable to hunting or disturbance with the increase in sage. There would be less hiding cover to flee to however, as the aspen stands are lost. A running mule deer would therefore be more vulnerable. Mule deer may be more likely to avoid the more open grass or open sagebrush stands during hunting season because of their vulnerability.

Moose will take advantage of the aspen which are coming up from the cutting which took place in 1989, but seeing as there would be few other aspen stands regenerating overall, the moose would frequent this area a little less.

As the sagebrush plants mature and grow larger and denser, the habitat for antelope will decrease. Unless the older sage plants start to die off, as predicted by some interests, to be replaced by smaller younger plants, the sage will thicken in canopy coverage, restricting the movement of antelope (Hoover et all. 1959). In Montana, average shrub canopy cover of antelope habitat was 10% to 24% (Bayless 1969).

Using the U.S. Fish and Wildlife Habitat Suitability Index model, currently, the habitat is rated at .65 (out a possible 1.0), with a projection of the habitat falling to .46 within 20 years before increasing back to .52 by 30 years. This increase after 20 years is due to the theory that the older sage plants will begin to die and be replaced by young plants regenerating naturally.

Studies in Wyoming and Colorado have shown that stands of sage taller than 30 inches covering more than 30% of an area tend to block an antelope's vision and cramp its sprinting style. Sage in the south Gravellies may approach 30 inches in height, but that would probably be maximum height for most plants. At this height the antelope may avoid the stands unless they begin a natural turnover and the older plants die off. Also, as the sage stands grow more dense, the availability and amount of forbs decreases, a food which antelope key on during the summer (Hoover et all. 1959).

These factors are figured into the U.S. Fish and Wildlife Antelope model mentioned above. Also included are reproductive requirements where optimal fawn habitat has standing vegetation averaging 22.8 to 45.7 cm (9-18 in.) (Einarsen 1948). Low ground cover enabled the does to observe the location of their young and provide excellent camoflage for the young.

Non-game and Small-game Species:

If prescribed fire is not used, and until a wildfire occurs, wildlife species dependent on aspen will be decreasing in numbers in the project areas. As described in existing condition, aspen stands have been and are dying out in the West Fork and Antelope Basin area. Based on a sample survey in the south Gravellies, approximately 1/2 of the aspen is in jeopardy of dying out.

It is reasonable to assume those species dependent on aspen will decrease in direct proportion to the loss of aspen. Species such as warbling vireo, sapsuckers, ruffed grouse, and other birds with near exclusive direct ties to aspen would be the first to leave the area. Other species who use the aspen as perch sites or are secondary cavity nesters would be the next to leave as the dead aspen fall and no longer become available. The last of the species to leave would be those dependent on the dead and down aspen. Aspen logs decay quickly and once gone, would have no replacements. Bluebirds, a bird of particular interest to visitors, would decrease in numbers due to the decrease in available nest cavities as the aspen stands die out.

In a savannah or grassland habitat type, the presence of trees, though few in number are of great importance, far out of proportion to their acreage. The loss of these trees from the ecosystem would be a serious loss to the diversity of the area.

As sagebrush increases in canopy cover, some species will decline in numbers. Species which would be decreasing include the longspurs, western meadowlark, horned lark, and mourning dove (Ryder 1972). Species which would be increasing would include Vesper sparrow, Brewer's sparrow, green-tailed towhee, and sage thrasher. Other species will decrease due to the increase in vertical architecture of the growing sage (Hatley and MacMahon, 1980).

Management Indicator Species:

Elk:

Elk response to no action will be minimal. Elk will continue to use the area for calving and as a nursery area even though forage for them will decrease. If there were a burn in adjacent localities, they would be drawn away from this area, but barring that, the elk will probably continue to use West Fork and Antelope Basin at the levels presently used.

There would be no impacts to elk calving areas in this alternative.

Pine Marten:

There is no change from present condition for this species.

Sage Grouse:

As described in the existing condition for sage grouse, the condition of the sagebrush is probably not the limiting factor in the population level of sage grouse. There is a possibility of the area becoming too heavy in sage (greater than 30-40% canopy cover). Sage grouse will avoid the area, but the current grouse population is so small that they could easily find enough stands with less canopy cover and there should not be a problem. The most likely impact on the sage grouse habitat would be a decrease in forbs available and a decrease in the condition of the riparian. This decrease in forbs would be the result of the increasing canopy coverage in the older sage stands. Decreases in the condition of riparian areas would result from the concentration of livestock and big game in the areas as forage quantity and quality in the uplands decreases.

Goshawk:

This bird is not likely to be impacted by the change in vegetation from this alternative except for the loss of aspen stands which would somewhat reduce nesting potential and the reduction in the diversity of prey available for this bird. It is expected that such changes would be very slight and that the overall reproductive capabilities of the hawk would not be adversely affected. Populations would be maintained to at least the existing levels.

Trumpeter Swan:

The trumpeter swans at Conklin Lake and those that fly over this area would not be impacted by the no action alternative.

Sensitive Species:

Boreal owl and harlequin duck would not be impacted by this alternative.

Ferruginous hawks use the sagebrush of the West Fork and Antelope Basin. The loss of aspens will reduce the number of available trees for nesting and perching, though ferruginous hawks are able to successfully nest on the ground. Compound that ability with the need for only one nest tree per several square miles and it is not likely that this alternative will have any significant impact on the species.

Impacts on western big-eared and spotted bats are not known though it is doubtful that this alternative would have any effects on these mammals.

Threatened and Endangered Species:

The four species listed: peregrine falcon, grey wolf, grizzly bear, and bald eagle, would not be impacted by the no action alternative. There will be a slight change in prey available for these species and a reduction in forbs available for the grizzly bear though this should not in any way impact the grizzly bear.

Alternative 2 - 10 Year Burning Cycle:

This alternative would shift 36% of the sage into grassland with very small sagebrush stands coming up while the remaining would be 20+ years in age. Canopy cover would be 15-30 %. This alternative strongly favors those animals preferring grasslands (early successional stages of sage) or those that key into fresh burn areas.

Big Game:

Mule deer will be attracted to the burn areas in the spring, and the does should benefit. During the fall, the reduction in hiding cover from the burns is much more important than the benefits from the spring greenup. By the end of 10 years, approximately 15,120 out of the 42,168 acres of sage would be 10 years or less. No matter which way you look at it, there would be much less mature sage for deer to be able to bed down and hide in. This increase in vulnerability could very well impact population numbers or resulting age class of the deer with the current State hunting regulations.

Antelope will benefit in the springtime for the first several years following burning by feeding on the highly nutritional forbs. The greenup in the burns, occurring several weeks prior to greenup elsewhere puts the antelope in much better condition going into the does' lactating season. Presumably, this would mean the fawns could be in better condition as a result of the does' improved diet. The does will avoid birthing in the most recent burns, preferring areas with a little more cover, be it grass or shrub. This alternative will provide for less acceptable fawning areas than the other two action alternatives. The burned areas would become excellent fawning areas after the first growing season, but in the first year, the fawns would be too exposed for the area to be used for fawning. Whether fawning habitat is limiting in this area is very debatable however.

The Habitat Suitability Index for antelope would improve from its present .65 to .82 by the end of 30 years implementation of the burning cycle.

The condition of winter ranges found elsewhere (there is no winter range in the project area), and the type of hunting season as set by the state will have far greater impacts on big game populations than the condition of the summer ranges affected by this proposal.

Non-game and Small-game Species:

The longspurs, meadowlark, horned lark, and morning dove and other species that prefer open habitat and grasses and forbs would benefit from this alternative. In his thesis on the effects of sagebrush burning on an ecosystem in northwest Wyoming, J. McGee found bird diversity after spring burns to return to preburn levels by 3 years. Fall burns were slower to recover. Nonbreeding densities actually increased after burning, utilizing burned areas for feeding and surrounding vegetation for resting and cover. Conversely, the response by nonbreeders was greater and lasted longer for fall burns compared to spring burns. Apparently, the nonbreeding birds responded positively to burns- the more complete the better, while breeding birds were detrimentally effected proportional to the intensity of the burn. (Fall burns often burn hotter and more completely than spring burns).

Sagebrush dependent species such as green-tailed towhee, Brewer's sparrow, sage sparrow would probably decrease in numbers along with other animals which need the structural composition of sage or other brush. Also included would be those species that need litter such as least chipmunk (Parmenter and MacMahon 1983). The magnitude of these decreases would be proportional to the amount of sage removed from the site and the size and intensity of the burn.

In summary, the diversity of wildlife after the burns would depend on the extent of the burn area, the mosaic pattern left, and the intensity of the burn. With this alternative, using a higher than "natural" fire frequency in the burn units, total diversity will be reduced even though some species or certain populations within these species (nonbreeders) may actually increase.

Management Indicator Species:

Elk:

Elk will positively respond to the burns for the first several years, feeding on both grasses and forbs during the spring. Since the sage in the Gravellies seldom reaches over 3 feet in height, elk generally do not use sagebrush for hiding cover. Elk will use sagebrush for security during calving. If there is any potential detrimental impact on elk, it would be during calving season. Approximately 2,613 acres of burn units lie within elk calving areas.

State biologists believe cow elk prefer sagebrush to calve in, though personnel observation and the radio locations indicate elk calve in a variety of habitats in the Gravellies. No research has been completed that confirms or refutes the elks' need to calve in sagebrush. Elk calf locations mapped for the Gravelly elk study do show the elk's preference for calving in the spring greenup zone in early June. This zone is predominately sagebrush.

As stated earlier, elk continued to increase in numbers during and after the spraying which killed large areas of the sage in the early 1970's. Apparently the elk are capable of calving successfully without the presence of large expanses of sagebrush. It should be noted however that they still may prefer to calve in sage.

Predation on elk calves has not been a significant factor in the Gravellies (Lonner personnel communication). If predation has not been a problem in the past even with the past spraying and burning, then it is unlikely that predation would suddenly become a problem because of the level of burning under this alternative.

Sage Grouse:

This alternative has the potential of decreasing the available acres of suitable habitat for sage grouse. Critical brood rearing habitat could be lost unless a buffer around wet meadows is retained. Sage grouse, preferring forbs and insects during the summer months also need adjacent cover (Peterson 1970, Wallestad et al. 1975). If these wet meadows, which are preferred feeding sites, have the adjacent sage burned, then they will be little used. Because of the larger number of acres burned under this alternative, the likelihood of this happening is greater. Retention of a buffer of 50 yards around the wet meadows would negate this adverse effect.

Klebenow (1972) suggested that fire could be an ideal tool to achieve a diverse habitat providing for all the needs of sage grouse. Gates (1983) suggested that fire could be used to enhance early brood rearing habitat.

Klebenow (1972) also cautioned that burning should not be conducted on sage grouse winter range but that "moderate burning coupled with grazing management," could improve nesting habitat. As stated earlier, this area is not winter range for sage grouse.

Not all researchers agree that fire can be beneficial for sage grouse. Braun (1987) stated "fire cannot be reported as a beneficial habitat modification practice for sage grouse without further research."

This alternative may impact leks if the burns encompass or borders the breeding areas. No leks have been located, nor are there any known historical leks in the area being analyzed. If any leks are located, a buffer surrounding the area would be a critical mitigation measure for this alternative. Wallestad and Schladweiler (1974) indicated a need for 1.5 mile buffer around leks.

The greatest impact of this alternative is the continuation of very young sage in the units with no time given for these stands to reach maturity. At 10 years, the young sage in the treated acres are only a few inches high, hardly tall enough to be considered a sagebrush stand, and certainly only minimally usable for a sage grouse for cover or nesting. The unburned areas within the mosaic would still be available for nesting and cover.

Alternative 3 - 20 year Burning Cycle:

This alternative, burning 1512 acres per year (756 acres actually blackened) on the average has less impacts, beneficial and otherwise, than alternative 2. Approximately 7,560 acres would be kept in a grassland or near grassland type condition.

Big Game:

Mule deer would be attracted to the burn areas as in Alternative 2, though they would be in fewer acres. There would be more acres of sage for deer to use as hiding cover than Alternative 2, though less than the no action alternative or Alternative 4. With 2/3 of the sage being old and capable of providing some cover to a deer lying down, the burning is not likely to have an adverse impact on mule deer in the fall. Vulnerability of the mule deer would be pretty much the same as the no action alternative.

Antelope would have less burn acres under this alternative than alternative two on which to feed during the spring. There would be more acres which would be moving towards a stage where it is undesirable antelope habitat. These acres would be approximately 40 years old by the end of the 20 year rotation, and would probably be at maximum height and density. The Habitat Suitability Index for antelope would be .84 as compared to the current .65 rating.

Non-game and Small-game Species:

Conditions under this alternative in comparison to the other alternatives would favor species that use old sage. Green-tailed towhee, Brewer's sparrow, sage sparrow could be at slightly higher numbers, given the increase in acres of old sage over current condition. These species would avoid the treated acres.

With the presence of grassland and young sage at this level, birds such as longspur, meadowlark, horned lark, and morning dove, would be close to existing numbers. The mosaic pattern could actually increase the habitat for those species preferring open grassland to feed, but needing some sort of canopy cover for nesting. With the remaining sage being older than the islands which would be present in Alternative 2, there would be greater vertical structure and a higher litter level present. These conditions would favor species such as sage thrasher and meadow voles.

Management Indicator Species:

Elk:

Elk will positively respond to the burns for the first several years, feeding on both grasses and forbs during the spring. There would be less acres available than Alternative 2, so benefits to elk in this regards would be less. If there is any adverse impact on elk, it would be during calving period.

Approximately 1,962 acres of burn units are located in elk calving areas. Any detrimental impacts would be less than Alternative 2 due to the reduced acres being treated per year. The remaining sage would have the opportunity to grow larger and denser, providing better calving habitat than Alternative 2.

Sage Grouse:

This alternative has the potential of improving sage grouse habitat or at least not significantly decreasing habitat provided the mitigation measures mentioned elsewhere are taken into consideration.

Alternative 4 - 30 year Burning Cycle:

This alternative burns the sagebrush closely to what is believed to be the natural burning frequency for this area. With approximately 1% of the sage actually burned in any one year, the impacts of this alternative are very local with minimal cumulative impacts associated to surrounding areas. Within the burn areas, this alternative comes closest to emulating the natural diversity and associated wildlife numbers and species likely to be found in the sagebrush habitat types.

Big Game:

Mule deer would key in on the new burns in the spring. Again, this would be less of a benefit than Alternative 2 and 3 due to reduced acres burned. Impacts on fawning habitat for deer would, like antelope, be minimal.

There would be more tall sage left standing than Alternative 2 or 3, though less than Alternative 1. Mule deer would therefore benefit in the fall with this alternative over the other 2 action alternatives.

Antelope would benefit to a lesser extent to the burning than from the levels found in Alternative 2 and 3 in the springtime during greenup. There would be more fawning cover than Alternative 2 and 3, though less than Alternative 1. This alternative should not alter the population in any way. The Habitat Suitability Index for antelope would be .78 as compared to the .65 that currently exists.

Non-game Species:

This alternative would have less grassland looking stands than present condition and therefore would have less habitat for those species preferring the open stands. Longspurs, meadowlarks, horned lark, and morning dove would decrease while sagebrush dependent species would increase, or have the potential to increase, to levels above present condition. Green-tailed towhee, Brewer's sparrow, sage sparrow would increase above present condition, though at levels lower than the no action alternative.

Management Indicator Species:

Elk:

Elk will positively respond to the burn in the spring being drawn to the early greenup in the recent burns. The reduced acres burned compared to the other action alternatives would tend to concentrate the herd of elk into the most recent burn areas, particularly in the West Fork where the majority of the elk are. With only 1008 acres treated per year over the entire area, and of that, only 1/2 actually burned, (in compliance with the mosaic pattern mitigation measure), the impacts on calving grounds will be minuscule at worst. Approximately 1,217 acres of burn units are located in elk calving areas.

Sage Grouse:

This alternative has the potential of improving sage grouse habitat, (though to a less amount than Alternative 3) or at least not significantly decreasing habitat provided the mitigation measures mentioned elsewhere are taken into consideration. This alternative allows the unit a chance to reach at least 30 years of age before burning, and the leave sage even older. There would be a significant increase in old sage in the area over present condition. This would allow the sage to start breaking up as theorized by some researchers. (As stated earlier, this theory remains untested.)

As stated earlier, some researchers question the benefit to sage grouse from fire. If this is true, then certainly the impact of burning of this alternative would be less than the other 2 alternatives. Cumulative effects would be the same as previous alternatives.

Consistency with Forest Plan Standards:

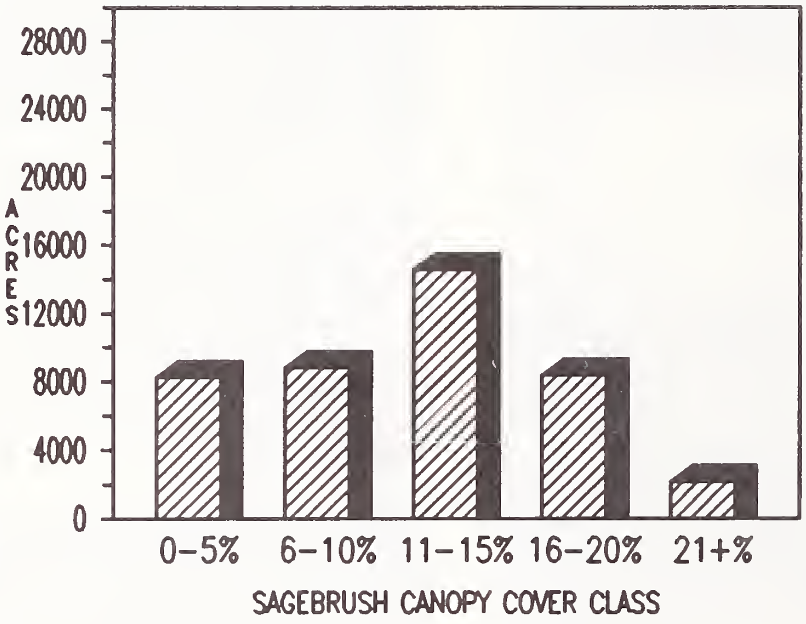
All action alternatives are consistent with Forest Plan standards for wildlife.

Landscape Diversity:

Introduction:

As noted in chapter III, the main element that affects the landscape diversity in the sagebrush/grass vegetation type is the density or canopy cover of the sagebrush along with the horizontal structure or placement of the plants. The current condition of the 42,168 acres of sagebrush/grass vegetation is mainly due to past management activities. Figure IV-1 displays the current condition of the sagebrush canopy cover found in the West Fork/Antelope Basin area. This provides a general view of how the area breaks out and does not show how the different canopy covers are distributed throughout the study area. These figures are not static. The figures displayed in each alternative discussion are based on how the sagebrush/grass vegetation will look after thirty years.

Figure IV-1. Existing Sagebrush Diversity.



Effects Common to All Action Alternatives:

Cumulative Effects:

In review of other state and federal agencies along with private landowners adjacent to the study area we have found there is potential for additional prescribed burning in the sagebrush/grass vegetation type. For the next five years on private lands south of the West Fork/Antelope Basin area there is potential for an additional 200-250 acres per year of prescribed burns. The landowner burned approximately 600 acres in the fall of 1990 which may reduce the number of acres to be burned in the future.In the reasonably foreseeable future no other government agencies, state or federal, have any plans for prescribed burning in the sagebrush/grass type. The effect of these activities would be the reduction in the density and structure of the shrub component on these sites. The initial change would be toward a more open grassy appearance with scattered shrubs.

Another potential activity that has and will affect the landscape diversity of the area is timber harvesting. The recovery of past logging units and the cutting of new units will affect the diversity within the forested areas. This will modify the overall landscape diversity in the West Fork/Antelope Basin area.

Direct and Indirect Effects by Alternative:

Alternative 1 - No Action:

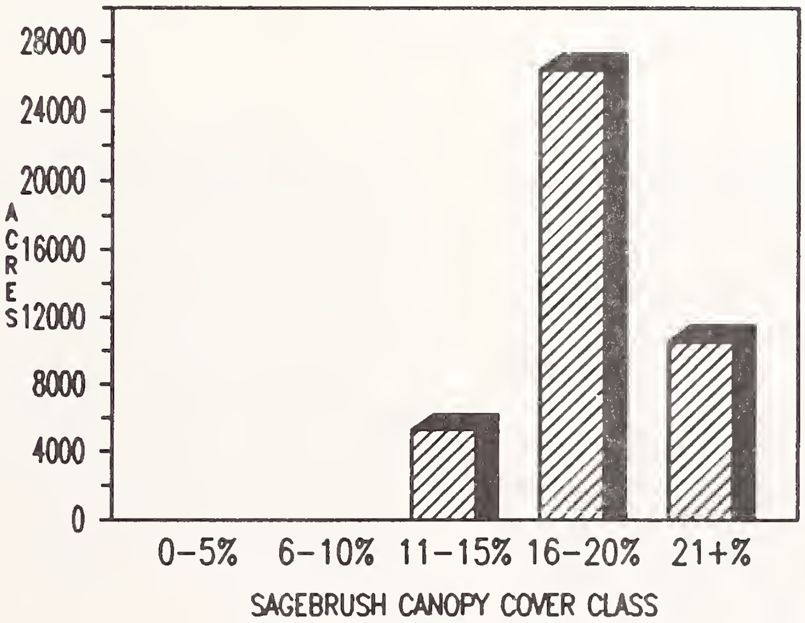
Under this alternative prescribed fire will not be used in managing the sagebrush/grass, aspen and conifer encroachment in the study area. Plant communities will be allowed to progress successionally in the absence of fire. Over time there will be a decrease in the landscape diversity. Sagebrush density will increase. Vertical and horizontal structural diversity will decline. Current grassy openings will close causing the loss of edge effect.

As discussed in the vegetation section of this chapter it has been theorized that given time dense stands of sagebrush will naturally break up and produce a mosaic of small openings and heavy shrub canopy(Wambolt, personnel communication). Even under this senario landscape diversity will decrease from current levels. The landscape will be dominated by large expanses of heavy shrub cover with small, unconnected openings scattered about.

Not only will the sagebrush/grass vegetation become more uniform there will be a loss of diversity in the aspen and sagebrush - forest ecotone. Without some type of catastrophic event such as fire, there is the potential to lose up to 50% of the current number of aspen stands. These stands will generally convert to conifer forest or sagebrush/grass vegetation. Conifer encroachment along the sagebrush - forest ecotone will continue to increase. These sites, in the absence of fire, will convert to closed canopy conifer stands. Review the vegetation section of this chapter and Affected Environment chapter for more information on these changes.

An approximation of the sagebrush canopy cover that would result from Alternative 1 is displayed in Figure IV-2. The graph is based on what the area would look like in thirty years.

Figure IV-2. Diversity of Sagebrush after 30 Years - No Action.



Alternative 2 - 10 Year Burning Cycle:

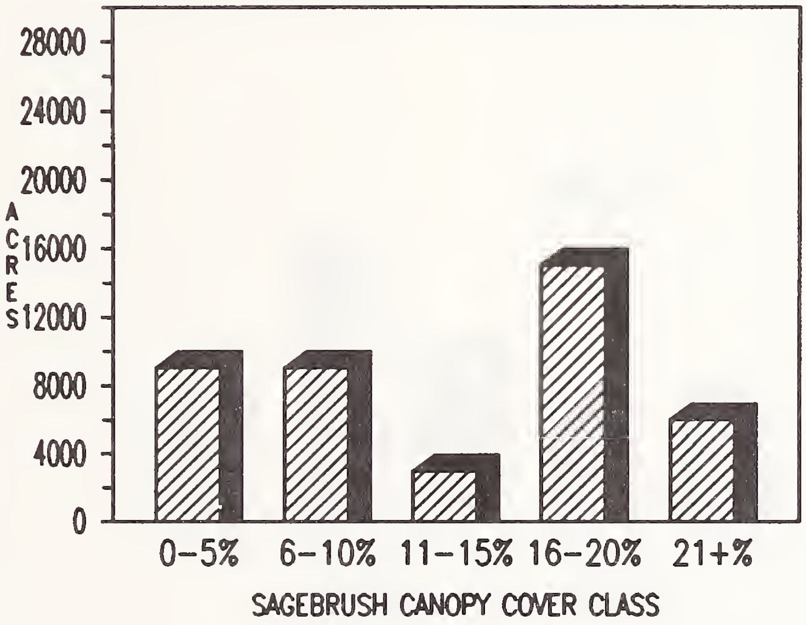
This alternative would treat the sagebrush in a ten year cycle. Approximately 3024 acres would be treated each year. The alternative would favor a landscape mosaic in the sagebrush/grass type dominated by a more open grassy appearance with scattered patches of shrubs. The density of sagebrush will decrease along with the vertical and horizontal structure on the site. Heavier stands of sagebrush would be found in the unburned areas within a unit and those sagebrush/grass types that are not scheduled for treatment.

Aspen condition would improve under this alternative. Fire will stimulate aspen growth along with setting back conifer development within individual stands. Reaction of individual aspen stands to fire is dependant on fire intensity. Due to the burning prescriptions to maintain a mosaic of burned and unburned sagebrush most aspen stands will only be affected by fire along the edges of a stand. This type of fire will cause a thinning of the mature trees and encourage an all-aged stand condition (Brown and Simmerman 1986). Some stands will burn at a higher intensity killing all mature trees and produce an even-aged stand. This alternative will improve the condition of aspen stands and maintain them as a part of the overall vegetative diversity in the West Fork/Antelope Basin area.

Those areas with conifer encroachment would be maintained in approximately the same appearance as they are found currently. These areas would continue to look like open park-like stands of Douglas Fir with a scattered sagebrush/grass understory. Prescriptions will be such that conifer seedlings are killed but most sapling trees protected. The treatment of these sites will prevent the conifers from completely filling in and changing the general appearance of the site to one of a dense conifer forest.

An approximation of the sagebrush canopy cover that would result from Alternative 2 is displayed in Figure IV-3. The graph is based on what the area would look like in thirty years.

Figure IV-3. Diversity of Sagebrush after 30 Years - Alternative 2.



Alternative 3 - 20 Year Burning Cycle:

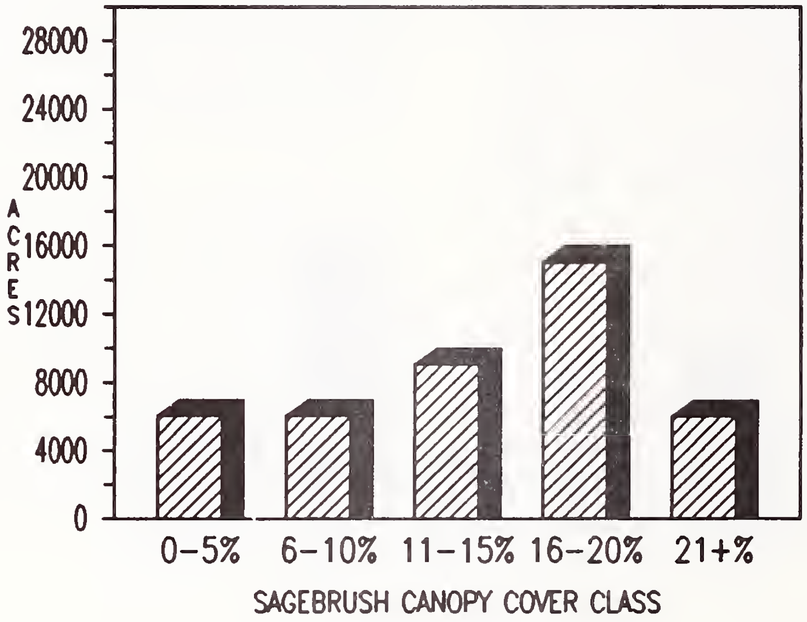
This alternative would treat the sagebrush in a twenty year cycle. Approximately 1512 acres would be treated each year. The alternative would produce a fairly even mix of different shrub densities. No one canopy cover class would dominate. The view of the sagebrush/grass type would be one of grass dominated openings intermixed with moderately dense to dense stands of sagebrush. The fire will produce a varied pattern of burned and unburned areas. The size and shape of the more open areas will be irregular, with an increase in edge effect in the community.

The vertical and horizontal structure within the sagebrush/grass vegetation will increase.

This alternative will have the similar affects on aspen stands and conifer encroachment sites as alternative 2.

An approximation of the sagebrush canopy cover that would result from Alternative 3 is displayed in Figure IV-4. The graph is based on what the area would look like in thirty years.

Figure IV-4. Diversity of Sagebrush after 30 Years - Alternative 3.



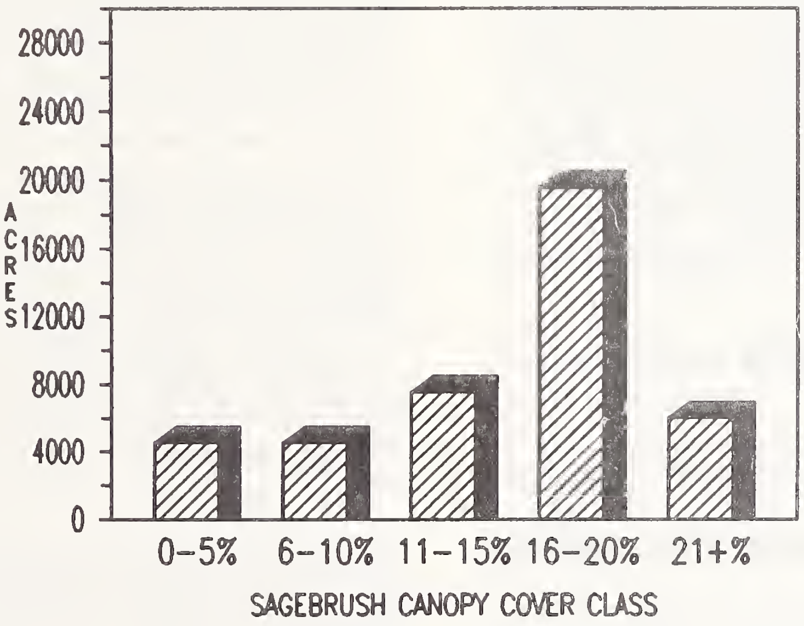
Alternative 4 - 30 Year Burning Cycle:

This alternative would treat the sagebrush in a thirty year cycle. Approximately 1008 acres would be treated each year. The alternative is similar to alternative 3. The visual effects on the burned sites will be the same but there will be a general dominance of the heavier shrub densities. A majority of the sagebrush/grass vegetation will be viewed as dense stands of sagebrush. The grass dominated openings will be fewer and widely scattered in the area. The overall structure within the sagebrush/grass type will decrease due to the dominance of the heavier canopy cover of sagebrush.

Generally this alternative would have the same affects on aspen stands and conifer encroachment sites as alternative 2. Due to the longer time frame to treat all sites, those aspen stands that must be deferred to the later years of the cycle may be lost. Conifer encroachment sites deferred to the later end of the cycle will have a higher density and canopy closure than current levels. By deferring units seedlings currently established may grow large enough to survive the fire treatment. This will alter the overall conifer density in the area.

An approximation of the sagebrush canopy cover that would result from Alternative 4 is displayed in Figure IV-5. The graph is based on what the area would look like in thirty years.

Figure IV-5. Diversity of Sagebrush after 30 Years - Alternative 4.



Consistency with Forest Plan Standards:

There are no specific Forest Plan standards relating to landscape diversity therefore a consistency finding can not be made.

Vegetation:

Effects Common To All Action Alternatives:

The action alternatives propose different levels of sagebrush treatment, location of burn units and unit scheduling. Fires affect on the different plant communities and individual plant species will be similar between alternatives. Burning prescriptions are generally the same throughout the alternatives. Prescriptions plan for a mosaic of burned and unburned sagebrush with 40% to 60% of the unit affected by fire.

The target plant species, Mountain Big Sagebrush, is easily killed by fire. Even low intensity fires burning beneath the shrub crown can kill this species. The two other sagebrush species common to the area, Silver and Three-tip, are known to sprout after fire. The percent of sprouting can be quite variable (Bunting 1989). Sites where these species are the indicated habitat type generally have been excluded from treatment. It has been suggested that plant communities where either of these species is present should not be treated by fire. The concern is that these species will increase in cover and dominance on the site. In reviewing past herbicide treatments and prescribed burns in the area this concern is not warranted. Sprouting by these species has occurred but not to any great degree. Within sites that have returned to pre-treatment sagebrush densities these species still comprise only 1-4% of the shrub canopy cover. All other shrub species that may be found in the burn units do sprout and are undamaged or only slightly damaged by fire.

Although spring burns will be preferred, each unit has the possibility to be burned either in the spring or fall. In general herbaceous plants respond positively to fire. Their response can be summed in table 1 below. Site specific affects can vary due to fire intensity, soil moisture and season of treatment. Spring burns usually burn cooler and have less affect on non-target plants than do fall burns. For species specific fire effects refer to Hironaka and others 1983, Blaisdell and others 1982, Tisdale and Hironaka 1981, Britton and Ralphs 1978, Fischer and Clayton 1983, Young 1983, Bunting and others 1987, Noste and Bushey 1987.

Table IV-1. General Response of Herbaceous Plants to Fire.

positive		nega- tive
<---	ANNUALS	-->
<----	PERENNIALS	
<------	GRASSES	
<---------	RHIZOMATOUS	
<----	COARSE LEAVED BUNCHGRASS	
	FINE LEAVED BUNCHGRASS	--->
<-----	FORBS	
<----------	RHIZOMATOUS	
<-	NON-RHIZOMATOUS	

Table 1. Generalized directional response of herbaceous vegetation to burning (Mueggler 1976).

The use of fire in those units where Douglas-fir has encroached out into the sagebrush/grass vegetation will hold the succession at an early seral state. These units are characterized by a scattering of conifer seedling and sapling overstory and sagebrush/grass understory. The fire intensity will determine the amount of conifer removal. Generally seedlings will be killed by a light fire with two foot flame lengths. To kill saplings, trees 4 to 5 inches diameter at breast height(d.b.h.), a hotter fire with flame lengths over three feet is needed (Gruell et al. 1986). Burning prescriptions will be written to kill back conifer seedlings but protect most sapling trees. This will maintain the area as an open park-like stand of scattered Douglas-fir with a sagebrush/grass understory.

Fire can be an effective tool in regenerating Aspen clones (Brown and Simmerman 1986, Jones and DeByle 1985, Mueggler 1988). Burning Aspen clones stimulates suckering even without complete overstory removal (Jones and DeByle 1985). Due to the remote nature of much of the West Fork/ Antelope Basin area prescribed fire is an appropriate means of aspen regeneration. Burning prescriptions to maintain a mosaic of burned and unburned sagebrush will limit the fire intensity as it moves through a clone. Fire will generally be restricted to the edges of aspen clones which will cause a thinning of the mature trees and encourage an all-aged stand condition (Brown and Simmerman 1986). Some stands will burn at a higher intensity killing all mature trees and produce an even-aged stand.

If the current aspen management is continued most clones that are in jeopardy will die out and be replaced by conifer or sagebrush/grass vegetation types. In those stands with conifer encroachment the next natural step without fire would be the loss of the aspen and dominance of the site by conifers. In these stands fire will stimulate aspen regeneration and also set back the conifer encroachment. By running fire through the clones the site will be maintained in an early successional state dominated by aspen.

Young aspen suckers are highly selected for by livestock and big game as browse. If livestock and big game concentrate their use on these suckers they can severely damage the aspen and negate any benefits of the treatment. By controlling the timing and intensity of livestock use after treatment and treating large enough acreage to keep wildlife from concentrating in a small area, overuse on the suckers should be controlled.

Herbage production generally increases in the sagebrush/grass, aspen and open conifer vegetation types after fire. The increased production is caused by the reduced competition with shrubs and trees and nutrient input to the soil from the burned material. The flush of new growth will be for the first few years after treatment. Measurement on the District show a 2.0 - 4.0 times increase in herbage production, two to three years after treatment. The increased production will gradually level off and then decline as the site returns to pre-treatment conditions. The length of time for the increased herbage production will vary from site to site. Studies have shown the higher herbage production to last from 15 to 30 years (Harniss and Murray 1973, Johnson 1969, Wambolt and Payne 1986, Gruell and others 1986).

For the first two to three years after a burn graminoids, forbs and to a lesser extent shrubs, are highly palatable to grazing animals. Plants are stimulated by the input of nutrients from the burned organic matter. Burning also removes dead material making more of the plant available to grazing. Livestock and big game will select for burned areas for these reasons. The preference of burned areas by livestock can help in reducing grazing pressure in sensitive areas such as riparian bottoms. The increased herbage production will also help in reducing overall grazing pressure in these areas. As with aspen the selection of burned areas by grazing animals require added management guidelines. Burning units should be of sufficient size to keep animals from concentrating on small areas and overgrazing them. The timing and intensity of livestock use after treatment will be controlled. Burn units will have at least one full season of growing season deferment after treatment.

The effects of the action alternatives on sensitive plants will be similar. As stated above grasses and forbs generally have a positive response to fire. The timing of the burns will generally be before plants have initiated growth in the spring or after they have cured in the fall. The potential for damage to any of the sensitive plants that may occur in the area is very low. Of the eight species considered only four would be found in the drier sagebrush/grass vegetation type; Jackson's Hole Thistle, Yellow Springbeauty, Keeled Bladderpod and Jove's Buttercup. The other four species, Showy Pussytoes, Idaho Sedge, Wolf's Willow and Alpine Meadowrue, are predominantly found in moist to wet meadows, boggy soil or along streambanks; these habitats will generally not be treated. Yellow Springbeauty may flower as early as April and run through early June. The sites where this plant grows usually are wet at this time and generally would not carry a fire. Keeled Bladderpod and Jove's Buttercup flower in June and July and would have died back to ground level by fall. All three of these species are relatively small and produce very little foliage. Jackson's Hole Thistle flowers in July and August and would be dormant by the fall burning period. The plant grows from 12 - 28 inches tall and produces a moderate amount of foliage. A similar species, Wavyleaf Thistle, *Cirsium undulatum*, showed only slight damage by fall burning(Britton and Ralphs 1978).

Cumulative Effects:

Under all action alternatives there is no reasonably foreseeable future action that may affect the targeted vegetation.

Direct and Indirect Effects by Alternative:

Alternative 1 - No Action:

Under this alternative prescribed fire will not be used in managing the sagebrush/grass, aspen and open conifer vegetation types. Plant communities will be allowed to progress successionally to a potential natural condition with the absence of controlled fire. The overall change in the area will be a decline in forage production and a decrease of vegetative diversity.

In the sagebrush/grass type with the absence of fire the shrub canopy will close. Large acreages of heavy (16-25% canopy cover) sagebrush cover will dominate. As the canopy cover increases grass and forb vigor will decline along with forage production (Tisdale and others 1969). Along with the overall decline in forage production there is a loss in forage availability. Dense sagebrush will form a physical barrier to grazing animals. With the reduced forage production and availability, livestock and big game animals will concentrate in the small grassy openings, riparian areas and the other vegetation types where forage is accessible. These areas can easily be overused.

It has been theorized that if these dense sagebrush stands remain untouched by fire they would naturally break up and produce a mosaic of small openings and dense shrubs (Wambolt, personnel communication). The breakup of the heavy canopy cover would be from natural mortality of the sagebrush due to age, insects, rodents and mechanical damage. As the sagebrush canopy opens, shrub competition would drop, allowing grass and forb vigor to improve and increased herbage production would return. No research has been completed to suggest a time frame for this natural progression. The amount of time the sagebrush/grass community would be in a condition of dense canopy cover would generally be in the tens of years.

Under the No Action alternative those areas currently viewed as scattered conifers in a sagebrush/grass community will become a fairly dense stands of timber. These sites would be classified as a Douglas Fir/Pinegrass h.t. (Pfister and others 1977). As the conifer overstory closes the shrub, graminoid and forb species now present on the site would be crowded out and replaced by more shade tolerant species such as Pinegrass, Elk Sedge, and Heart-leaf Arnica.

Aspen clones under this alternative would continue to deteriorate. There is the potential to lose close to 50% of the aspen to conifer encroachment and old age. Surveys done in the Antelope basin area show half of aspen in a deteriorated condition. Clones had no substantial or healthy regeneration and nearly all had some conifer encroachment. Without some natural catastrophic event, these stands are predicted to convert to conifer or grassland dominated sites. The exact time that all aspen in the stands are lost varies from clone to clone, but within 30 years all of the aspen stands which were surveyed are projected to be lost. Treatment of aspen by cutting will continue but due to the remote nature of much of the West Fork/Antelope Basin area, use of manual treatment will be limited.

Sensitive plants generally would not be affected by this alternative. There is the possibility of some negative affects on these plants as canopy cover closes and forage production decreases. The reduced availability of forage will cause grazing animals to concentrate in smaller areas. Use in open meadows and riparian areas will increase. This increased use could have a detrimental affect on sensitive plant populations that may occur in these areas.

Alternative 2 - 10 year Burning Cycle:

This alternative would treat the sagebrush in a ten year cycle. Approximately 3024 acres would be treated each year. The alternative would favor a landscape mosaic dominated by early successional stages. Late seral stages would be found in the unburned areas within a unit and those sagebrush/grass types that are not scheduled for treatment. Very little of the area would be in the mid seral successional stage.

Forage production would increase under this alternative. Of the three action alternatives the ten year burning cycle would increase herbage production the greatest. The ten year cycle favors the early successional stage and keeps plant vigor and production high.

This alternative would treat the aspen at the fastest rate. The aspen clones would be treated early enough to prevent the loss of those stands currently in jeopardy of dying out.

Conifer encroachment would also be set back. Those units where conifers have moved out into the sagebrush/grass community will be held at an early to mid seral condition. Seedling conifers will be killed but the larger sapling trees will generally be unharmed. The overall appearance of the unit will be of an open park-like stand of scattered Douglas Fir with a sagebrush/grass understory.

Alternative 3 - 20 year burning cycle:

This alternative would treat the sagebrush in a twenty year cycle. Approximately 1512 acres would be treated each year. A full range of successional stages would be present with a moderate favoring of the late seral stage. Early and mid seral successional stages would be evenly distributed. No particular successional stage will dominate the area.

This alternative will increase forage production and maintain it at the second highest level of the action alternatives. The twenty year cycle maintains this level of forage production by keeping an even distribution of successional stages in the area. Sites are treated before sagebrush cover becomes heavy and starts to affect the vigor and production of the grasses and forbs.

Aspen stands would be treated early enough to prevent the loss of most of those stands currently in jeopardy of dying out. Those stands that are in the worst condition at this time may be lost if treatment is deferred to the later years of the cycle.

This alternative will have the same affect on conifer encroachment as alternative 2.

Alternative 4 - 30 year burning cycle:

This alternative would treat the sagebrush in a thirty year cycle. Approximately 1008 acres would be treated each year. A full range of successional stages would be present with a favoring of the late seral stage. Early and mid seral successional stages would be evenly distributed. Even with heavier favoring of late successional stages, a full range of habitats will be maintained.

Forage production under this alternative would increase from present conditions. Production increases in individual units would average the same as the other action alternatives but overall forage production in the area would be the lowest of the action alternatives.

The alternative would be similar to alternative 3. Due to the longer treatment cycle more of the aspen clones that are currently in jeopardy of dying out may be lost.

The affects of the treatment cycle on conifer encroachment will be similar to the other two action alternatives. This alternative may allow a slightly higher density and canopy closure of conifers after treatment in those units that are deferred to the later years of the cycle. By deferring units to the end of the thirty year cycle seedlings currently established may grow large enough to survive the fire treatment. The overall appearance of the unit will still be of an open park-like stand of Douglas Fir with a sagebrush/grass understory.

Consistency with Forest Plan Standards:

There are no specific Forest Plan standards against which to compare the effects of the alternatives relative to this issue.

Livestock Management:

Introduction:

Maintenance of livestock grazing was a management concern in the integrated resource analyses conducted in the West Fork Madison and Antelope Basin areas. Improvement of forage production for livestock and big game is a part of the purpose and need in Chapter I. The following discussions describe the assumptions and methodologies used to analyze and display the effects of each alternative in relation to management concerns and the purpose and need.

In general, the effects are displayed as the changes in quantities of forage produced and what such changes would mean in range capacities for livestock and big game. Changes in forage production are displayed as estimates of the total pounds produced in a given alternative. The total pounds produced are then translated into the animal unit months (AUM's) of grazing capacity available. Total grazing capacity is then displayed in terms of AUM's available to livestock and big game individually.

Past research and more recent field inventories were studied to develop baseline forage production figures within sagebrush/grassland communities. The study was initiated to determine an average level of grass and forb production within sagebrush communities containing 15-20% canopy cover. Sagebrush communities with 15-20% canopy cover constitute most of the sites where burning is proposed and establishing pre-burn forage production estimates would provide a means to compare anticipated increases with what would occur naturally.

Study #1 - In 1977 through 1979, W.F. Mueggler and W.L. Stewart conducted a three year clipping study of grass and forb production under sagebrush communities with 15-20% canopy coverage. The study was conducted in the Cliff Lake Research

Natural Area (RNA) which is very close to many of the sites proposed for burning. The close proximity of the study to areas proposed for burning is therefore very representative of actual ground conditions and extrapolation of the data is not necessary.

Over this three year period, it was found that the average annual grass and forb production was approximately 962 pounds per acre.

The complete study is incorporated in the project file and is noted in the literature citations in the Appendix.

Study #2 - In 1988, W.F. Mueggler revisited the Cliff Lake RNA to follow-up the earlier work. An additional clipping study was performed in the South Grassland area on Cliff Lake bench. Production of grasses and forbs in this review totalled approximately 1026 pounds per acre.

Details of this study are available in the project file.

Study #3 - During the summer of 1990, personnel from the Madison Ranger District completed further clipping studies in the Antelope Basin area. The study included areas of 15-20% canopy cover on the Horn Mountain pasture of the Antelope Basin allotment and the Shawfield pasture of the Conklin allotment. These clipping studies resulted in grass and forb production figures of approximately 562 pounds per acre.

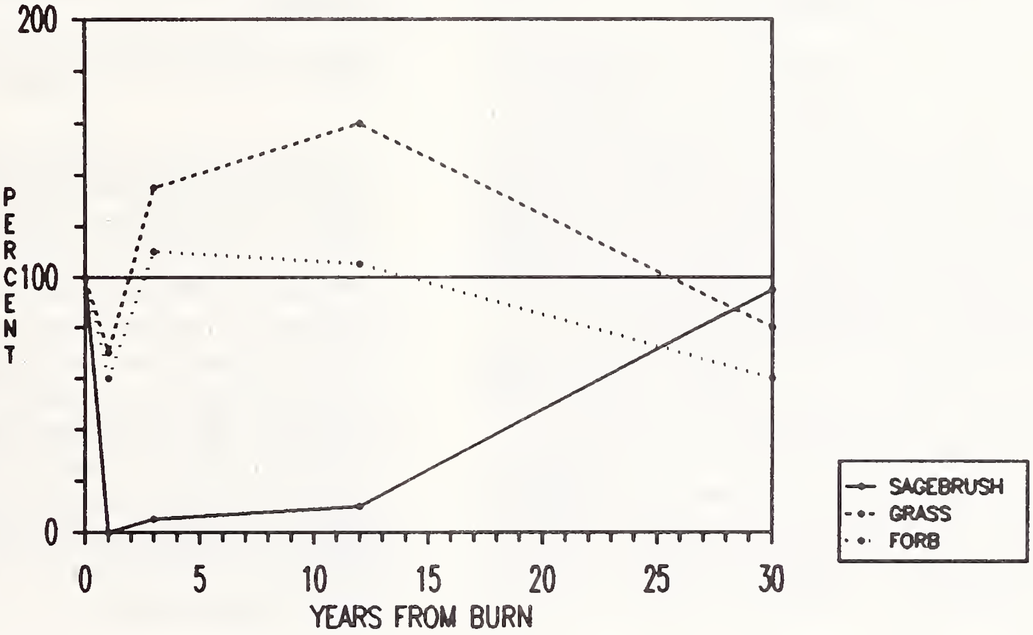
Details of this study are available in the project file.

Baseline productivity figures were determined by averaging the results of the three studies. Average productivity was therefore assumed to be approximately 850 pounds per acre for the West Fork Madison and Antelope Basin areas. The interdisciplinary team thought that this figure was a reasonable assumption.

A second assumption was developed to determine the expected response of the forage in the burned areas. To develop this assumption, past research by Harniss and Murray (See Literature Citations) and recent field examinations by Madison District personnel were reviewed.

Figure IV-6 depicts the relative change in sagebrush, forbs, and grasses over 30 years following fire. (Harniss and Murray 1973)

Figure IV-6. Sagebrush, Grass and Forb response to Fire.



In August, 1990, clipping studies of burned and unburned areas immediately adjacent to each other were conducted by District personnel. The results of the study are displayed in the following table:

Table IV-2. Forage Productivity on Burned and Unburned Areas.

AREA	PRODUCTIVITY-LBS/AC Unburned	Burned	FACTOR OF CHANGE
Conklin Allotment-Shawfield Unit 3, 2 years post burn	625	2050	+ 3.28
Antelope Basin Allotment.Horn Mtn Pasture. 4 years post burn	500	2450	+ 4.90
Elk Mountain S&G Allotment.4 years post burn	1800	3900	+ 2.16

Through analysis of this data, the interdisciplinary team determined that on an average, forage production increases by a factor of 2 in years 1-10 following a burn, decreases to a factor of 1.5 in years 11-15, and returns to preburn levels after year 15. These factors translate into average forage production figures of 1700 pounds per acre (years 1-10), 1275 pounds per acre (years 11-15), and 850 pounds per acre (years 15+).

A third assumption necessary to complete the analysis was to establish a utilization factor for livestock. The purpose and need stated that an objective of the project was to enhance livestock and big game forage. If this is to be accomplished, how much forage would be utilized by livestock, and how much would be available for big game? Forest Service Handbook (FSH) 2209.21 R1, Section 432 suggests that an average AUM requires approximately 780 pounds of forage. Forest Plan Standards for range (Forest Plan, pg II-34) prescribed utilization levels for various vegetative types. In this project area, the dominant vegetative type is grass/grasslike forb. Allowable utilization ranges from 45-55% depending on the grazing system employed.

For purposes of this analysis, the interdisciplinary team agreed that an average of 50% utilization by livestock would be a reasonable figure. The remaining 50% would be available for big game and other resource values. The significance of the forage needs per AUM and 50% utilization will become more apparent in the the discussions of direct and indirect effects that follow.

A fourth assumption, also a feature of all alternatives, is the objective of attaining a mosaic of burned and unburned areas within each burn unit. The ratio of burned to unburned area will vary from unit to unit depending on the specific objectives. The ratios will range from 40% burned and 60% unburned to 60% burned and 40% unburned. Overall, an average of 50% burned and 50% unburned will be achieved on the total acres treated. This assumption is needed as part of the discussion of changes in forage production and discussions related to vegetative/habitat diversity.

The final assumption in the analysis is that the current grazing systems will not change. As was described in Chapter III, the current systems have been in place for some time, and have been very successful. Condition of the vegetation on the allotments is good and trends are upward. Maintenance of these systems and the vegetation trends is the objective as described in the purpose and need.

Effects Common to All Action Alternatives:

On primary ranges, all the action alternatives will result in a net increase in available forage for livestock and big game. As forage increases in quantity and distribution within the pastures, livestock will also be better distributed. They will be drawn to the flush of nutrient rich grasses and forbs on the uplands. This will reduce the pressures on riparian areas and contribute toward maintaining their quality. As quantities of forage increase and livestock numbers remain constant, there will also be additional quantities of forage available for big game. The degree to which forage will be available to livestock and big game is described in the following discussions.

Direct and Indirect Effects by Alternative:

Alternative I - No Action:

Alternative I burns no sagebrush. An effect of this alternative would be a gradual reduction in the forage available for livestock and big game on the primary ranges. As succession continues in the sagebrush habitat types and canopies continue to close, overall grass and forb production would decrease. Access to the forage through the heavier sagebrush canopies would also be reduced. The general decrease in forage and greater canopy covers would encourage heavier utilization in pockets of more open canopies and in the riparian areas. This could result in the onset of more serious resource impacts. Plant vigor would start to deteriorate, soil compaction and erosion would be encouraged, and overall site productivity would be reduced. Heavier utilization of riparian areas would be encouraged with subsequent degradation of riparian values.

The effect on livestock management from the onset of these conditions would be a need to adjust either the number of permitted livestock or the seasons of use. If the same grazing seasons were continued, numbers of livestock could be reduced by as much as 18-20%

This effect is quantified in more detail in the following computations. These computations bring forward the assumptions developed earlier in this section.

As the 30,239 acres of primary range advance through succession and canopy covers achieve 15-20%, average forage production will be 850 pounds per acre.

30,239 acres X 850 pounds per acre = 25,703,150 pounds of total forage.

1 AUM requires 780 pounds of forage.

25,703,150 total pounds of forage divided by 780 pounds per AUM = 32,953 total AUMs of capacity.

It was assumed that utilization by livestock would average 50% of available forage to meet Forest Plan standards.

32,953 total AUMs divided by 2 = 16,477 AUMs actually available for use by livestock.

There are currently 20,131 AUMs of use permitted on the primary ranges. Allowing these ranges to progress through succession will result in a need to reduce livestock use by 3,654 AUMs (18%) if 50% of the forage is to be retained for big game.

Alternative II - 10 year cycle:

Alternative II would result in approximately 3024 Acres per year (1512 acres actually blacked with a 50% mosaic) being burned. Forage production on these acres would result in increased forage availablility from a livestock and big game standpoint. This alternative would provide the most forage based on the amount of acres treated each year and the availability of that forage. The livestock management system and livestock numbers would not change under this or any of the action alternatives. Forage produced in excess of that required for livestock will be available for big game and watershed values. The increased forage will result in overall reductions of use as livestock are spread over a broader area on the allotments.

The effects of this alternative are quantified in more detail in the following computations. The same assumptions used in the No Action alternative are used in all the action alternatives along with some additional assumptions.

Under this alternative there would be approximately 1512 acres per year burned. Upon completion of the 10 year cycle, there would be approximately 15,120 acres in early successional stages (years 1-10) and 15,120 acres in late successional stages (years 15+). There would be few areas in the mid successional stages.

Forage production figures for this alternative are as follows:

15,120 acres in early succession X 1,700 pounds per acre = 25,704,000 pounds of forage.

15,120 acres in late succession X 850 pounds per acre = 12,852,000 pounds of forage.

Total production = 38,556,000 pounds of forage.

38,556,000 total pounds divided by 780 pounds per AUM = 49,431 total AUMs available.

With an average of 50% utilization by livestock, 49,431 AUM's divided by 2 = 24,716 AUM's available for livestock.

24,716 AUM's minus the 20,131 AUM's currently permitted will result in an additional 4,585 AUM's of forage available for big game.

Alternative III - 20 year cycle:

Alternative III would result in approximately 1512 acres per year (756 acres actually blackened with a 50% mosaic) being burned. Forage production on these acres would result in increased forage availability from a livestock and big game standpoint. The livestock management system and livestock numbers would not change under this alternative. Forage produced in excess of that required for livestock will be available for big game and watershed values. The increased forage will result in overall less use within the allotment as livestock use is spread out over a broader area.

Under this alternative there would be approximately 756 acres per year burned. Upon completion of the 20 year burning cycle there would be approximately 7,560 acres in early, 3,780 acres in mid, and 18,899 acres in late successional stages.

Forage production figures for this alternative are as follows:

7,560 acres in early succession X 1,700 pounds per acre = 12,852,000 pounds of forage.

3,780 acres in mid succession X 1,275 pounds per acre = 4,819,500 pounds of forage.

18,899 acres in late succession X 850 pounds per acre = 16,064,150 pounds of forage.

Total production = 33,735,650 pounds of forage.

33,735,650 pounds divided by 780 pounds of forage per AUM = 43,251 total AUM's of capacity.

With an average of 50% utilization by livestock, 43,251 AUM's divided by 2 = 21,626 AUM's available for livestock.

21,626 AUM's minus the 20,131 AUM's currently permitted will result in an additional 1,495 AUM's of forage available for big game.

Alternative IV - 30 year cycle:

Alternative IV would result in approximately 1008 acres per year (504 acres actually blackened with a 50% mosaic) being burned. Forage production on these acres would be maintained at existing levels from a livestock and big game standpoint. This alternative would provide forage for the existing big game and livestock numbers at this time. No increase in livestock numbers or management systems would be made.

Under this Alternative there would be appoximately 504 acres per year burned. Upon completion of the 30 year cycle, there would be approximately 5,040 acres of early, 2,520 acres of mid, and 22,679 acres of late successional stages.

Forage production figures for this alternative are as follows:

5,040 acres in early succession X 1,700 pounds per acre = 8,568,000 pounds of forage.

2,520 acres in mid succession X 1,275 pounds per acre = 3,213,000 pounds of forage.

22,679 acres in late succession X 850 pounds per acre = 19,277,150 pounds of forage.

Total production = 31,058,150 pounds of forage.

31,058,150 pounds divided by 780 pounds of forage per AUM = 39,818 total AUM's of capacity.

With an average of 50% utilization by livestock, 39,818 AUM's divided by 2 = 19,909 AUM's available for livestock.

19,909 AUM's minus the 20,131 AUM's currently permitted will result in a reduction of approximately 222 AUM's of livestock capacity. This alternative would essentially maintain the existing conditions relative to livestock management on the allotments.

Consistency with Forest Plan Standards:

All action alternatives are consistent with Forest Plan range standards.

Watershed:

Introduction:

Sturgis (1975 a,b&c, 1977 a&b, 1979, 1980, 1983, 1986 a&b, 1987, 1990) has done a great deal of work concerning the hydrologic relationships of sagebrush lands. The majority of this work has been in Wyoming and southern Idaho. The sagebrush control employed during this work was spraying of 2,4-D, but the burning of sage would produce the same results. Some of these relationships that are most pertinent to this EIS are:

1) Soil Moisture Use. Sagebrush has a two-storied root system, which influences the way soil moisture is used. A dense root network exists down to 60 cm, with a taproot extending down to 180 cm. Water near the plant is used first, and then water usage shifts outward and downward until about the first week of August, when water uptake ceases. Sagebrush control will increase soil moisture where the soil depth is equivalent to the maximum rooting capability of the plant - about 2 meters. In shallower soils, any increase in moisture is often used by the replacement vegetation.

2) Snow Accumulation and Melt. Plant height controls the depth of snow accumulation, with taller plants retaining more snow on-site than shorter ones.
Often, depth of snow is greater in areas where sagebrush has been controlled. This increase is attributable to the fact that snow intercepted by sagebrush crowns is more susceptible to sublimination, and to the longwave radiation emitted from the sagebrush plant. Sagebrush control appears to have no affect on melt rates, either when the snowpack depth exceeds the plant height or when the depth is within the crown canopy. However, snowmelt proceeds at a much quicker rate when the snow depth is less than that of the sagebrush.

3) Total Annual Runoff and Timing. Generally, runoff from sagebrush lands receiving less than 14 inches of precipitation per year is negligible. The project area is very similar to this precipitation regime. Sagebrush control on an entire watershed increased yields 0.42 inches, or about 20% of the total flow. About 65% of the increase came during the snowmelt period, and the remainder as groundwater flow later in the year. Streamflow increases persisted for 12 years.

4) Sediment Transport. Sediment transport in the sagebrush zone occurs during snowmelt runoff, with 90% of the sediment moving during 5-10% of the year. Intense summer thunderstorms move the greatest amount of sediment, but their occurrence is sporadic and unpredictable. Oversnow flows, which can occur during late springs when cool weather is followed by a rapid warming trend, cause peak flows that sharply elevate sediment loads. However, sagebrush control on a small watershed has not shown any increase in sediment yields.

In summary, treating a large portion of the sagebrush on a given drainage has increased the flow of water for a considerable period of time. During that period, little surface erosion and no increases in sediment yields were measured. It is reasonable to assume that should a watershed that has been treated receive a peak precipitation or runoff event before replacement vegetation has become established, significant increases in sediment production would result.

Direct and Indirect Effects Common to All Action Alternatives:

Increases in water yield or sediment resulting from any of the Alternatives will be negligible in terms of effects on the water or fishery resource in the project area. Burn units make up less than 5% of any given sub-watershed in any of the three major drainages, and the cumulative total of all the burn units is less than 5% of the area of the major drainages. Additionally, only 40-60% of the area inside individual burn units will be blackened, so the actual area affected will be much smaller than what is portrayed by burn unit percentages. The fact that such a small area of any given drainage will be treated makes the chance for adverse effects in the stream exceedingly small. The mitigation measures that will be applied (50' buffer strip on flat ground, and 100' buffer strip on ground over 15%) will provide adequate filtering for any erosion that does occur in the burn units.

Cumulative Effects Common to All Alternatives:

As stated in Chapter III, the three major drainages affected by the project do not confluence until hundreds of miles downstream. If there are no direct or indirect effects to the channels on-site, there will be no cumulative effects in the larger drainages.

Consistency with Forest Plan Standards:

All alternatives are consistent with Forest Plan Standards for fisheries and watershed.

Roadless Areas:

Introduction:

The environmental effects on the Freezeout Mountain Roadless Area are analyzed in relation to the seven roadless characteristics and wilderness features presented in Chapter III. Direct and indirect effects are measured for the specific alternatives.

Cumulative effects are measured as a combining of effects from past management activities in the areas, the direct and indirect effects of the alternatives, and the potential effects of reasonably forseeable future actions. Past management activities utilized in the analysis are discussed in Chapter III.

Reasonably forseeable future actions considered in this analysis are the future West Fork Madison timber sale proposal, the assumed continuation of livestock grazing in the Roadless Area, and the continuation of burning projects beyond 1996 that would be necessary to complete the burning cycles described in the alternatives.

The West Fork Madison Timber Sale is located to the North and East of Roadless Area 1-029A with some activities occurring adjacent to the Roadless Area boundary. At this point in the analysis of the timber sale, entry into the roadless area is not being proposed.

Direct and Indirect Effects Common to All Action Alternatives:

Natural Integrity:

With the long history of grazing, sagebrush spraying and burning, and maintenance of fences, water developments, cabins etc, the natural integrity of the area will not be adversely affected any further by any of the alternatives.

Apparent Naturalness:

The existing mosaics of sagebrush and grassland will change but in none of the alternatives is this change expected to occur so quickly that major changes in the appearance of the area will be obvious. The "black" areas immediately following a burn will be obvious but will be short term in nature. It is doubtful whether the visitor could distinguish whether the burn was natural or man caused. The overall character of the project areas will not differ from the surrounding patterns of sagebrush, grasslands, aspen, and conifer stands.

None of the action alternatives will alter the apparent naturalness of the of the area to any measurable degree.

Remoteness and Solitude:

Opportunities for remoteness and solitude are minimal within the current condition. The additional personnel and vehicle traffic present in the area during the burning periods would increase the levels of human presence for a short period but given the condition of the current settings, this effect should virtually go unnoticed.

None of the action alternatives will adversely affect either of these characteristics.

Special Features and Special Places and Values:

None of the action alternatives propose burning within the Cliff Lake Research Natural Area therefore there will be no impact to the RNA. In all alternatives, one unit (Freezeout #6) is located in close proximity to Elk River which has been nominated as a possible addition to the Wild and Scenic River System. Burning this unit will not introduce any measureable changes within the river corridor and it will not forclose any of the possible options of classifying the river as Wild, Scenic, or Recreational.

Manageability:

None of the action alternatives are proposing the kind of vegetative management that will irreversibly or irretrievably remove the area from future wilderness consideration.

Cumulative Effects Common to All Action Alternatives:

It is assumed that livestock grazing will continue at it's current levels into the reasonably forseeable future. Reasonably forseeable timber sale activities will not enter the roadless area. Future sagebrush and aspen burning will continue as the burning cycles within the alternatives are initiated.

As described above, direct and indirect effects of the burning alternatives will be very minimal if measureable at all. There are no projected impacts from the future timber sale, and assuming continuation of current grazing levels, there would be no change in either the kind or degree of impacts from grazing management. In taking these factors under consideration and combining the potential impacts of all of them together, it is determined that there will be no significant cumulative effects on the roadless area.

None of the alternatives of the proposed action in combination with other reasonably forseeable actions will irreversibly or irretrievably remove the Freezeout Mountain Roadless Area from future wilderness consideration.

Consistency with Forest Plan Standards:

There are no standards against which to compare the effects or conclusions relative to the roadless issue.

Air Quality:

Direct and Indirect Effects Common to all Action Alternatives:

The burning of sagebrush under any of the action alternatives will cause smoke to be evident in the air for a period of time. Emissions will be subject to the coordinating requirements of the Montana Smoke Management Memorandum of Agreement dated July 31, 1978.

Consistency with Forest Plan Standards:

Coordination of burning activities through the Memorandum noted above and compliance with State and Federal air quality standards is consistent with Forest Plan standards.

POTENTIAL CONFLICTS WITH PLANS AND POLICIES OF OTHER JURISDICTIONS:

The following statements are provided to help define the areas of potential differences between the agency proposing the action (U.S. Forest Service) and the policies, management, and enforcement responsibilities of other agencies with whom the Forest Service cooperates.

Wildlife:

The Forest Service and the Montana Department of Fish, Wildlife, and Parks each manage wildlife but work with differing aspects. The Forest Service manages the land and affects wildlife through manipulation of habitat. The State manages the animals more directly through regulation of seasons, bag limits, and enforcement of other wildlife rules and restrictions.

Potential conflicts exist where the Forest Service proposes actions to achieve National Forest objectives which may not fully satisfy more specific State management objectives for the same area.

Both the Forest Service and U.S. Fish and Wildlife Service cooperate in the management and recovery of Threatened and Endangered species. The Fish and Wildlife Service coordinates and supervises activities relating to T & E species. The Forest Service consults with the Fish and Wildlife Service when T & E species may be affected by a proposed project.

Air Quality:

The burning projects will have a local effect on air quality. Burning activities will be coordinated with the State Air Quality guidelines administered by the Montana Airshed Committee. Emmissions will be subject to the coordinating requirements of the Montana Smoke Management Memorandum of Agreement dated July 31, 1978.

There are potential conflicts between the committments of the State to maintain clean air, and the desire of the Forest Service to meet land management goals.

PROBABLE ENVIRONMENTAL EFFECTS THAT CAN NOT BE AVOIDED:

Wildlife:

Any of the action alternatives will result in a change in habitat diversities. While this change will not affect big game populations for the most part, there will be shifts in the populations of non-game species.

Landscape Diversity:

The action alternatives will initiate changes in the landscape. The distribution and proportions of sagebrush to grassland will change between the alternatives. The rate of change will be gradual and over relatively small segments of the landscape at a time. It is expected that such gradual change will hardly be noticeable.

Freshly burned areas will be blackened and readily visible. This effect is expected to be short term as the grasses and forbs stimulated by the fire will cover the burned area within a growing season.

A positive effect of all alternatives is the regeneration and maintenance of the aspen's contribution to landscape diversity.

Air Quality:

Smoke emissions will temporarily affect air quality in the project vicinity. Through incorporation of State air quality standards and guidelines into burning prescriptions, good smoke dispersal is expected and the effects will be minimal.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES:

An irreversible commitment of resources refers to the loss of production or use of a resource due to a land decision, that once executed, can not be changed. An irretrievable commitment of resources applies to losses of production or use of renewable resources for a period of time.

There are no irreversible or irretrievable commitments of resource production or uses resulting from this proposal.

SUMMARY OF THE RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY:

Long-term productivity refers to the capability of the Forest to provide resources into the future. All of the action alternatives provide levels of forage production to maintain livestock and big game populations both now and into the future. The stimulation of forage production in the mosaics designed into the alternatives will also maintain a diversity of wildlife habitats. Big game, small game, and non-game habitats will be provided throughout the project area now and into the future.

SPECIFICALLY REQUIRED DISCLOSURES:

Effects of Alternatives on Social Groups:

The alternatives do not differ with one another in their effects on minorities, Native American Indians, women, or the Civil Liberties of any American Citizen.

Effects of Alternatives on Floodplains and Wetlands:

There are small bogs, wet meadows, and riparian areas scattered throughout the project area. The wet areas are important wildlife habitat features. Forest Plan standards and guidelines offer general protection to these sites. In the case of this proposal more specific protection is provided to protect the value of wet meadows and riparian sites as feeding areas for sage grouse. Burn units will also be set back from stream sides to protect water quality.

Effects of Alternatives on Threatened and Endangered Species:

There is an active bald eagle nest in the project area. The Forest Service has consulted with the U.S. Fish and Wildlife Service. The result of the consultation is that the project, along with specific mitigation, can be implemented without adverse effect to the eagles.

Energy Requirements and Conservation Potential of Alternatives:

From a global perspective on energy reserves and consumption, the added effects of the action alternatives in terms of petroleum consumption are relatively insignificant.

Effects of the Alternatives on Prime Rangeland, Forest Land, and Farm Land:

The alternatives presented are in compliance with the Federal Regulations for prime land. The definition of prime forest land does not apply to lands within the national forests. The project area does not contain any prime farm land. In all alternatives, Federal lands will be managed with the appropriate consideration of adjacent lands.

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GLOSSARY

A

AIRSHED	A basic unit in which air quality is managed.
ALTERNATIVE	One of several policies, plans, or projects proposed for decisionmaking.
ANALYSIS AREA	A grouping of homogeneous land areas, formed from the land and resource inventory data comprising the data base. Similarities are in terms of common capabilities to produce resources and susceptibility to impacts. Analysis areas need not be contiguous areas of land.
ANIMAL UNIT MONTH	The quantity of forage required by one mature cow (1,000 pounds or the equivalent) for one month.

B

BEST MANAGEMENT PRACTICES (BMPs)	The set of standards in the Forest Plan which, when applied during implementation of a project, ensures that water related beneficial uses are protected and that State water quality standards are met. BMP's can take several forms. Some are defined by State regulation or memoranda of understanding between the Forest Service and the States. Others are defined by the Forest interdisciplinary planning team for application to specific management areas; these are included as Management Area Standards in the appropriate management areas. A fourth kind, project level BMP's are based on site specific evaluation, and represent the most effective and practicable means of accomplishing the water quality and other goals of the specific area involved in the project. These project level BMP's can either supplement or replace the Forest Plan standards for specific projects.
BIG GAME	Those species of large mammals normally managed as a sport hunting resource.
BIOLOGICAL EVALUATION	An assessment required by the Endangered Species Act of 1973 to identify any threatened, endangered or sensitive species which is likely to be affected by a proposed management action, and to evaluate the potential effects of the proposed action on the species or their habitats.

C

CANOPY	The continuous cover of branches and foliage formed collectively by the crowns of adjacent trees and other woody growth, such as sagebrush.
COMPETITION	The more or less active demand by two or more organisms at the same time for some environmental resource (such as sunlight, water, or nutrients), in excess of the supply available, typically resulting in the ultimate elimination of the less effective organism.
CULTURAL RESOURCES	The physical remains of human activity (artifacts, ruins, burial mounds, petroglyphs, etc.) and conceptual content or context (as a setting for legendary, historic, or prehistoric events as a sacred area of native peoples, etc.) and of an area.
CUMULATIVE EFFECT	The impact on the environment which results from the incremental impact of the action when added to other actions. Cumulative impacts can also result from individually minor but collectively significant actions taking place over a period of time.

D

DEFERRED GRAZING SYSTEM	A grazing system where all pastures within an allotment are utilized during a given year but some are deferred during all or part of a season to allow for nutrient storage or seed production.
DEVELOPED RECREATION	Recreation that occurs where improvements enhance recreation opportunities and accommodate intensive recreation activities in a defined area.
DIRECT EFFECTS	Effects on the environment which occur at the same time and place as the initial cause or action.
DISPERSED RECREATION	That portion of outdoor recreation use which occurs outside of developed sites in the unroaded and roaded Forest environment i.e.,hunting, backpacking and berry picking.
DISTURBANCE	Any management activity that has the potential to accelerate erosion or mass movement. Also, any other activity that may tend to disrupt the normal movement or habits of a particular wildlife species.
DIVERSITY	The distribution and abundance of different plant and animal communities and species within an area.

E

EARLY SUCCESSIONAL COMMUNITIES	The plant community that develops immediately following the removal of existing vegetation from an area.
ECOSYSTEM	A complete, interacting system of organisms considered together with their environment (for example; a marsh, a watershed, or a lake).
EFFECTS	Physical, biological, social and economic results (expected or experienced) resulting from natural events or management activities. Effects can be direct, indirect and/or cumulative.
ENDANGERED SPECIES	Any species which is in danger of extinction throughout all or a significant portion of its range and listed as such by the Secretary of the Interior in accordance with the Endangered Species Act of 1973.
ENVIRONMENT	The aggregate of physical, biological, economic, and social factors affecting organisms in an area.
EPHEMERAL STREAMS	Streams that flow only as a direct response to rainfall or snowmelt events. They have no baseflow.
EROSION	The wearing away of the land's surface by water, wind, ice, or other physical processes. It includes detachment, transport, and deposition of soil or rock fragments.

F

FLOOD PLAIN	Low land and relatively flat areas joining streams, rivers, and lakes which are periodically inundated by over-bank flows of water.
FORAGE	All browse and non-woody plants available to livestock or wildlife for feed.
FORB	Any herbaceous (herb-like) plant other than grass or grass-like plants.
FUELS	Living plants and dead, woody vegetation that are capable of burning.

H

HABITAT	A place where a plant or animal naturally or normally lives and grows.
HABITAT TYPE	An aggregation of all land areas potentially capable of producing similar plant communities at climax.

I

INDICATOR SPECIES	Species identified in a planning process that are used to monitor the effects of planned management activities on viable populations of wildlife and fish including those that are socially or economically important.
ISSUE	A subject or question of widespread public discussion or interest regarding management of National Forest System lands.

K

KEY WILDLIFE HABITAT COMPONENTS	Areas or features of the forest which are of particular importance for maintaining overall wildlife habitat. These areas and features include; moist areas, wallows, meadows, parks, critical hiding cover, thermal cover, migration routes and staging areas.
KEY WINTER RANGE	An are, generally of low elevation, that big game annually need in order to survive during normal winters. This area encompasses the area used by the majority of animals in the population during the winter (variable, but commonly between 12/1 and 4/1)

L

LAND ALLOCATION	The assignment of a management emphasis to particular land areas to achieve the goals of the issues, concerns, and opportunities identified in the planning process.
LANDTYPE	An area of land classified on the basis of geomorphic attributes. This classification system is based on an understanding of geologic processes (as reflected in land surface form and features), individual kinds of soil, and the factors which determine the behavior of ecosystems (i.e., climate, vegetation, relief, parent materials, and time).
LEK	A site where grouse traditionally gather for sexual display and courtship.
LONG-TERM EFFECTS	Those effects which generally occur after the maximum 15 year life of the Forest Plan.

M

MANAGEMENT AREA	An aggregation of capability areas which have common management direction and may be noncontiguous in the Forest. It consists of a grouping of capability areas selected through evaluation procedures and used to locate decisions and resolve issues and concerns.
MANAGEMENT CONCERN	An issue, problem, or a condition which constrains the range of management practices identified by the Forest Service in the planning process.
MANAGEMENT DIRECTION	A statement of multiple-use and other goals and objectives, the associated management prescriptions and the associated standards and guidelines for attaining them.

MANAGEMENT INDICATOR SPECIES (MIS)	A plant or animal which, by its presence in a certain location or situation, is believed to indicate the habitat conditions for many other species.
MANAGEMENT PRACTICE	A technique or procedure commonly applied to forest resources, resulting in measurable outputs or activities.
MANAGEMENT PRESCRIPTION	Management practices and intensities selected and scheduled for application on a specific area to attain multiple use and other goals and objectives.
MITIGATION	Avoiding or minimizing impacts by limiting the degree or magnitude of the action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact by preservation and maintenance operations during the life of the action.
MONITORING (OR EVALUATION)	An examination, on a sample basis of Forest Plan management practices, to determine how well objectives have been met and a determination of the effects of those management practices on the land and environment.
MULTIPLE USE	The management of all the various renewable surface resources of the National Forest System so that they are utilized in the combination that will best meet the needs of the American people. The most judicious use of the land will be made for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions. Some lands will be used for less than all the resources. Management of the various resources will be harmonious and coordinated, without impairment of the productivity of the land, with consideration being given to the relative values of the various resources, and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output.

N

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)	An act to declare a National policy that will encourage productive and enjoyable harmony between man and his environment, to promote efforts that will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man, to enrich the understanding of the ecological systems and natural resources important to the Nation, and to establish a Council on Environmental Quality.
NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) PROCESS	An interdisciplinary process, mandated by the National Environmental Policy Act, which concentrates decisionmaking around issues, concerns, alternatives, and the effects of alternatives on the environment.
NATIONAL FOREST MANAGEMENT ACT	A law passed in 1976 as amendments to the Forest and Rangeland Renewable Resources Planning Act that requires the preparation of Regional and Forest plans and the preparation of regulations to guide that development.
NATIONAL FOREST SYSTEM	All National Forest lands reserved or withdrawn from the public domain of the United States; all National Forest lands acquired through purchase, exchange, donation, or other means; the National Grasslands and land utilization projects administered under Title III of the Bankhead-Jones Farm Tenant Act (50 Stat. 525, 7 U.S.C. 1010-1012); and other lands, waters, or interests therein which are administered by the Forest Service or are designated for administration through the Forest Service as a part of the system.
NATIONAL REGISTER OF HISTORIC PLACES	A listing maintained by the National Park Service of areas which have been designated as being of historical value. The Register includes places of local and State significance as well as those of value to the Nation as a whole.
NEPA	See National Environmental Policy Act.
NFMA	See National Forest Management Act.

NO ACTION ALTERNATIVE	An alternative where no activity would occur. The development of a No Action Alternative is requested by regulations implementing the National Environmental Policy Act (490 CFR 1502.14). The No Action Alternative provides a baseline for estimating the effects of other alternatives.
NONGAME	Species of animals which are not managed as a sport hunting resource.

O

OBJECTIVE	A specified statement of measurable results to be achieved within a stated time period. Objectives reflect alternative mixes of all outputs or achievements which can be attained at a given budget level. Objectives may be expressed as a range of outputs.

P

PERENNIAL STREAM	A stream which normally flows throughout the year.
PERMITTED GRAZING	Use of a National Forest range allotment under the terms of a grazing permit.
PRESCRIBED BURNING	The intentional application of fire to wildland fuels in either their natural or modified state under such conditions as allow the fire to be confined to a predetermined area and at the same time to produce the intensity of heat and rate of spread required to further certain planned objectives (i.e. silviculture, wildlife management, etc.)
PRESCRIBED FIRE	A fire burning under specified conditions which will accomplish planned objectives in strict compliance with an approved plan and the conditions under which the burning takes place and the expected results are specific, predictable and measurable.
PRIMITIVE ROS CLASS (PRIM)	Area is characterized by an essentially unmodified natural environment of fairly large size. Interaction between users is very low and evidence of other area users is minimal. The area is managed to be essentially free from evidence of man-induced restrictions and controls. Motorized use within the area is not permitted.
PUBLIC INVOLVEMENT	A Forest Service process designed to broaden the information base upon which agency decisions are made by (1) informing the public about Forest Service activities, plans, and decisions, and (2) encouraging public understanding about and participation in the planning processes which lead to final decisionmaking.
PUBLIC ISSUE	A subject or question of widespread public interest relating to management of the National Forest System.

R

RANGE ALLOTMENT	A designated area of land available for livestock grazing upon which a specified number and kind of livestock may be grazed under a range allotment management plan. It is the basic land unit used to facilitate management of the range resource on National Forest System and associated lands administered by the Forest Service.
RANGELAND	Land on which the climax vegetation (potential natural plant community) is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing and browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundra, and certain forb and shrub communities. It also includes areas seeded to native or adapted introduced species that are managed like native vegetation.

RECORD OF DECISION	A document separate from but associated with an environmental impact statement that publicly and officially discloses the responsible official's decision on the alternative assessed in the environmental impact statement chosen to implement.
RECREATION OPPORTUNITY SPECTRUM (ROS)	A system designed to inventory, analyze, and manage Forest recreation settings and opportunities. The system categorizes National Forest System land into six classes, each class being defined by its setting and by the probable recreation experience and activities it affords.
RESEARCH NATURAL AREA	An area in as near a natural condition as possible, which exemplifies typical or unique vegetation and associated biotic, soil, geologic, and aquatic features. The area is set aside to preserve a representative sample of an ecological community primarily for scientific and educational purposes; commercial and general public use is not allowed.
REST ROTATION GRAZING SYSTEM	A grazing system in which animals are moved from one pasture to another on a scheduled basis, with one pasture left ungrazed in a given year. The number of pastures used in the system will dictate how often a given pasture is rested.
RIPARIAN AREAS	Areas with distinctive resource values and characteristics that are comprised of aquatic and riparian ecosystems, 100 year flood plains and wetlands. They also include all upland areas within a horizontal distance of approximately 100 feet from the edge of perennial streams or other perennial water bodies.
ROADED MODIFIED ROS CLASS (RM)	Area is characterized by a substantially modified natural environment where evidence of man's activities are readily apparent. Such activities are usually resource-based. Typical activities include timber harvest, mineral extraction, and livestock grazing. Such evidences may or may not harmonize with the natural environment. Interaction between users may be low to moderate, but evidence of other users prevails. Resource modification and utilization practices are readily evident and may dominate. Conventional motorized use is provided for in the construction standards and design of facilities.
ROADED NATURAL APPEARING ROS CLASS (RNA)	Area is characterized by a predominantly natural appearing environment with moderate evidences of the sights and sounds of man. Such evidences usually harmonize with the natural environment. Interaction between users may be low to moderate, but with evidence of other users prevalent. Resource modification and utilization practices are evident, but harmonize with the natural environment. Conventional motorized use is provided for in the construction standards and design of facilities.
ROADLESS AREA	Undeveloped Federal land within which there are no improved roads or roads maintained for travel by means of motorized vehicles intended for highway use.
RURAL ROS CLASS (R)	Area is characterized by substantially modified natural environment.

S

SCOPING	The procedures by which the Forest Service determines the extent of analysis necessary for a proposed action, i.e., the range of actions, alternatives and impacts to be addressed, identification of significant issues related to a proposed action, and establishing the depth of environmental analysis, data, and task assignments needed.
SEDIMENT	Any material, carried in suspension by water, which will ultimately settle to the bottom of streams.
SEMI-PRIMITIVE MOTORIZED ROS CLASS (SPM)	Area is characterized by a predominantly natural or natural-appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other area users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but are subtle. Motorized use is permitted.

SEMI-PRIMITIVE NON-MOTORIZED ROS CLASS (SPNM)	Area is characterized by a predominantly natural or natural-appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but are subtle. Motorized use is not permitted.
SENSITIVE SPECIES	Plant and animal species identified by the Regional Forester for which population viability is a concern as evidenced by; (1) significant current or predicted downward trends in population numbers or density, and (2) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.
SMALL GAME	Birds and small mammals permitted for hunting or trapping.
STANDARD	An objective requiring a specific level of attainment; a rule to measure against; a guiding principle.
STREAM ORDER	A measure of the position of a stream in the hierarchy of tributaries (stream as referenced here refers to perennial streams). a. First order streams are unbranched streams, that is they have no tributaries. b. Second order streams are formed by the confluence of two or more first order streams. They are considered second order until they join another second order or larger stream. Third order streams are formed by the confluence of two or more second order streams. They are considered third order until they join another third order or larger stream.
SUCCESSIONAL STAGE	A phase in the gradual supplanting of one community of plants by another.
SUITABILITY	The appropriateness of applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental consequences and the alternative uses foregone. A unit of land may be suitable for a variety of individual or combined management practices.

T

THREATENED OR ENDANGERED SPECIES	Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range and one that has been designated as a threatened species in the Federal Register by the Secretary of Interior.
TOPOGRAPHY	The configuration of land surface including its relief, elevation, and the position of its natural and manmade figures.

W

WATERSHED	The total area above a given point on a stream that contributes water to the flow at that point.
WETLANDS	Areas that are inundated by surface or ground water with a frequency sufficient to support, and under normal circumstances does support, a prevalence of vegetation or aquatic life that require saturated or seasonally saturated soil conditions for growth and reproduction.

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APPENDIX A

ECONOMIC EFFECTS

Purpose

The economic effects analysis was conducted to provide a comparison of the monetary costs and benefits associated with the forage production of each proposed alternative. It is intended to give the decision maker the assurance that economic effects were considered in the design of each alternative and the discretion to use this monetary cost/benefit information in the decision process. This analysis is not intended to evaluate the overall cost effectiveness of the grazing program in the area under consideration. That level of economic analysis is conducted during development of the Forest Plan.

Introduction

The EIS evaluates four alternatives for managing the forage production and habitat diversity through a systematic controlled burning program on approximately 30,240 acres of grassland/ sagebrush habitat in the Antelope Basin and West Fork Madison area of the Madison Ranger District of the Beaverhead National Forest. This appendix describes the analyses conducted on the economic effects of the alternatives relative to how they change current allotment conditions. Forage production was the only output that was considered in the economic analysis because there is no reliable quantitative data on the economic costs and benefits of changes in habitat diversity.

The economic analysis covered two phases of forage production that each of the alternatives go through. The first phase is the transition period where the land is brought from its current condition to its "steady state" future condition by the management activity of the alternative. (The steady state condition is defined as the point where the forage production remains constant from one year to the next.) Regardless of the alternative, it requires 15 years of consistent management practices to achieve a steady state in forage production. The present net value (PNV) is calculated for each alternative for this 15 year transition period to compare the economic performance of the alternatives during this phase.

The second phase analyzed is the steady state period where the costs and benefits in each alternative remain constant from year to year. The net value for a single year (undiscounted) is calculated for each alternative. This figure provides the value used to compare the economic performance of each alternative beyond the transition phase.

Economic Data and Assumption used in the Analysis

The following data and assumptions were used in the economic analysis:

The analysis was done using 1990 constant dollars.

Forage used by livestock has a value of $1.86 per AUM based on existing fees, and a value of $8.65 per AUM based on the 1990 RPA Program listed approximation of consumer surplus estimated values for forage.

An AUM (Animal Unit Month) equals 780 pounds of forage.

An estimated 14,185 AUMs (approximately 70% of the total allotments for the area) are used yearly by livestock on the 30,240 acres considered for prescribed burning management.

Livestock utilization of the forage will be limited to 50% or less of 75% of the total forage produced per year. Allotments will be decreased to meet this limitation where required. (Because of the rest-rotation grazing system currently used, 25% of the land--and its associated forage production--is not grazed each year. Livestock use will be limited to 50% on areas grazed.)

Forage production is 1700 pounds/acre on the early successional vegetation stage (1-10 years after burning), 1275 pounds/acre on the mid successional vegetation (11-15 years after burning), and 850 pounds/acre on the late successional vegetation (over 15 years after burning).

Allotments will not be increased above current levels, regardless of forage production levels.

Areas burned would average a mosiac of 50% burned and 50% unburned within the boundaries of the prescribed burn.

The prescribed burn area per year for each alternative is the proportional amount required to cover the total area in a complete cycle. (For example, on the 20 year burn cycle 1512 acres would be prescribed burned each year [30240 / 20 = 1512]. Actual acres blackened would average 706 acres per year because of the 50% burn mosaic.)

The cost per prescribed burn is $5 per acre for the entire burn area. (From the above example, the burn cost is $7560 per year [1512 * 5 = 7560]).

In the 10 year burn rotation where areas will be reburned before all the vegetation within an area reaches the late successional stage, the burn mosaic will be 50% land that was not burned during the previous burn cycle and 50% land that was burned during the last burn cycle.

The current vegetative condition is 16% (4840 acres) early successional, 3% (910 acres) mid successional, and 81% (24490 acres) late successional.

As specified in Forest Service Manual 1970, the discount rate used in calculating the present net value is 4%.

Economic Analysis of Alternatives During the Transition Phase

There were three steps involved in the economic analysis of the transition phase. The first step of this analysis consisted of determining the forage produced per year for each alternative. The second step was to calculate the PNV for each alternative based on the changes to the current costs and benefits of existing allotments. The last step consisted of some sensitivity analysis on factors that weren't quantified, e.g., the cost to change an allotment plan and the value of additional forage not used by livestock.

DETERMINING FORAGE PRODUCTION

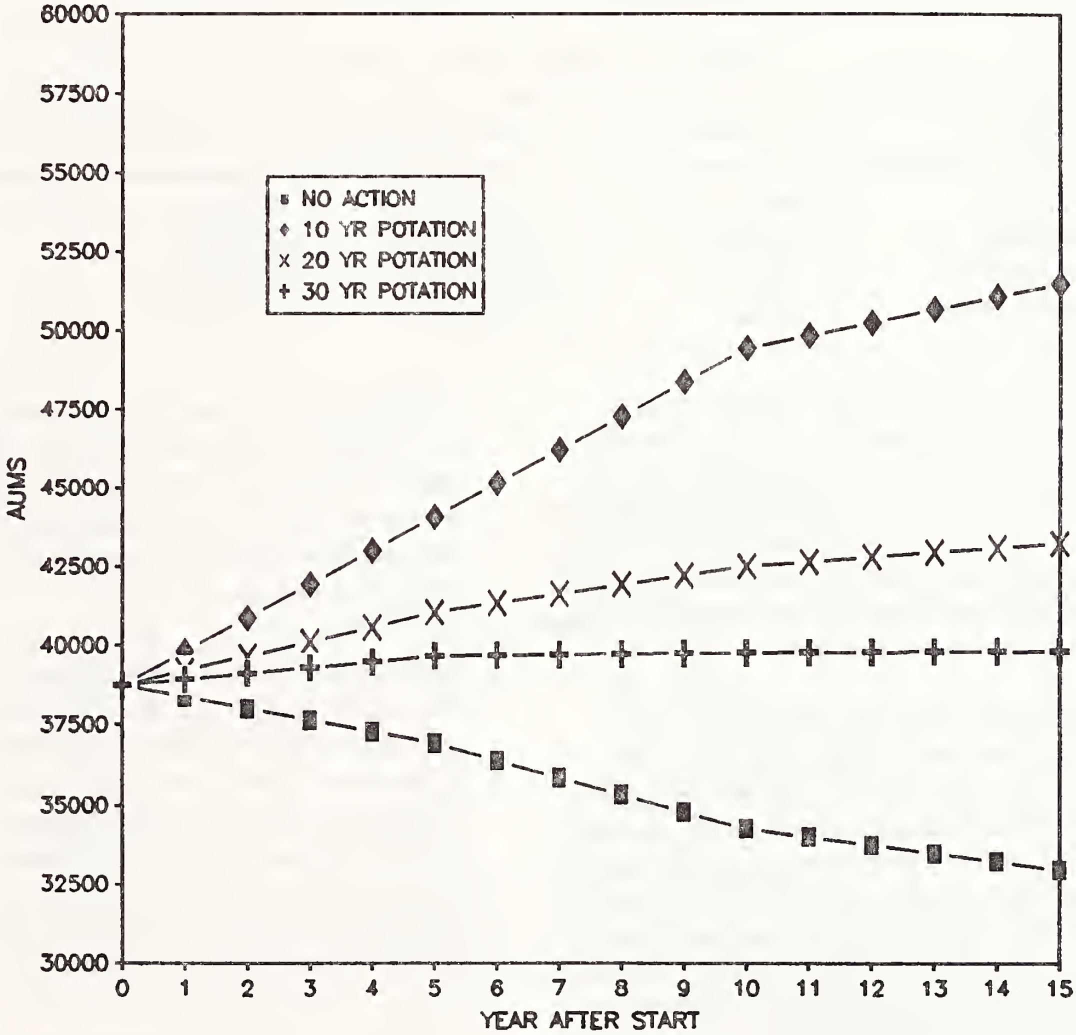
The amount of forage produced per year by alternative was calculated based on changes in the amount of early, mid, and late successional forage lands resulting from the management intensity of each alternative. This calculation was made by dividing the area into equal sized blocks of land, where the number of blocks per alternative equalled the rotation cycle, i.e. the 30 year alternative had 30 blocks of land. (The exception to this was the no action alternative, which could be handled in one unit.) The amount of land currently in the different forage successional stages was allocated to these blocks of land under the assumptions that the different successional stages could be isolated and had been created in a uniform pattern by past management practices.

For example, in the 30 year alternative the early successional forage was evenly distributed through 10 blocks of land, the mid successional forage was evenly distributed through another 5 blocks of land, and the remaining 15 blocks of land were late successional forage. (Both the early and mid successional blocks also had late successional forage acres as needed to account for all the acres in the block.) Each block of land was also assigned an age within its successional stage. The early successional stage blocks were years 1 through 10, the mid successional stage blocks were years 11 through 15, and the late successional stage blocks were years 16 through 30. The burning was conducted on the "oldest" blocks first, so the 30 year block was burned in the first year. Also in the first year, the 15 year block converted to a late successional block and the 10 year block converted to a mid successional block. Based on the resulting changes in the acreage for each successional stage, the amount of forage produced was calculated for the year. This methodology was applied to each action alternative. (See the project folder for a detailed listing of the forage production data developed by this methodology for each alternative.)

For the no action alternative the percent of land in the early and mid successional stages was proportionally decreased for 15 years, at which time all lands were in the late successional stage.

Figure A1 displays the changes in forage production over time by alternative.

FIGURE A1. TOTAL FORAGE PRODUCED BY EACH ALTERNATIVE



CALCULATION OF PRESENT NET VALUE

The calculation of the present net value (PNV) considered only the direct project costs and benefits that are in addition to the costs and benefits associated with the current grazing allotments. Specifically, only the burning costs and the decreases in allotment grazing caused by decreased forage production were factored into the PNV calculation. (As stated in the Data and Assumptions section above, allotment use of forage would not increase event if forage production increased significantly.) While this may be considered a narrow view of the economic effects of the alternatives, it does focus the economics on the factors that can be reliably quantified. The sensitivity analysis described below addresses some costs and benefits that cannot be as reliably quantified.

While the change in allotment AUMs caused by a decrease in forage production can be reliably derived, the dollar value to associate with those AUMs is somewhat controversial because the federally charged grazing fee is not the market value of the forage. It is generally accepted that the market value of a commodity, rather then an administrative fee, should be used in an economic analysis (Workman, 1986). However, for this analysis both values where used, which are $1.86/AUM for the fee charged and $8.65/AUM for the market value of grazing as specified in the 1990 RPA report.

The PNVs for the alternatives are shown in Table A1 below. (Refer to the project management file for a detailed listing of the PNV calculations.)

Table A1. Transition Phase PNV Values

Alternative	Burning Cost	AUM Fee Value	AUM Market Value
No Action	None	-$16,979	-$78,965
10 Year Rotation	-$174,834	No Change	No Change
20 Year Rotation	-$87,417	No Change	No Change
30 Year Rotation	-$58,278	No Change	No Change

As shown in the table above, the No Action alternative is the only alternative where the PNV changes with a change in the value of an AUM. This is due to the No Action alternative causing a decrease in the level of permitted AUMs, while the three action alternatives are not allowed to increase permitted AUMs even though they increase forage production above current levels.

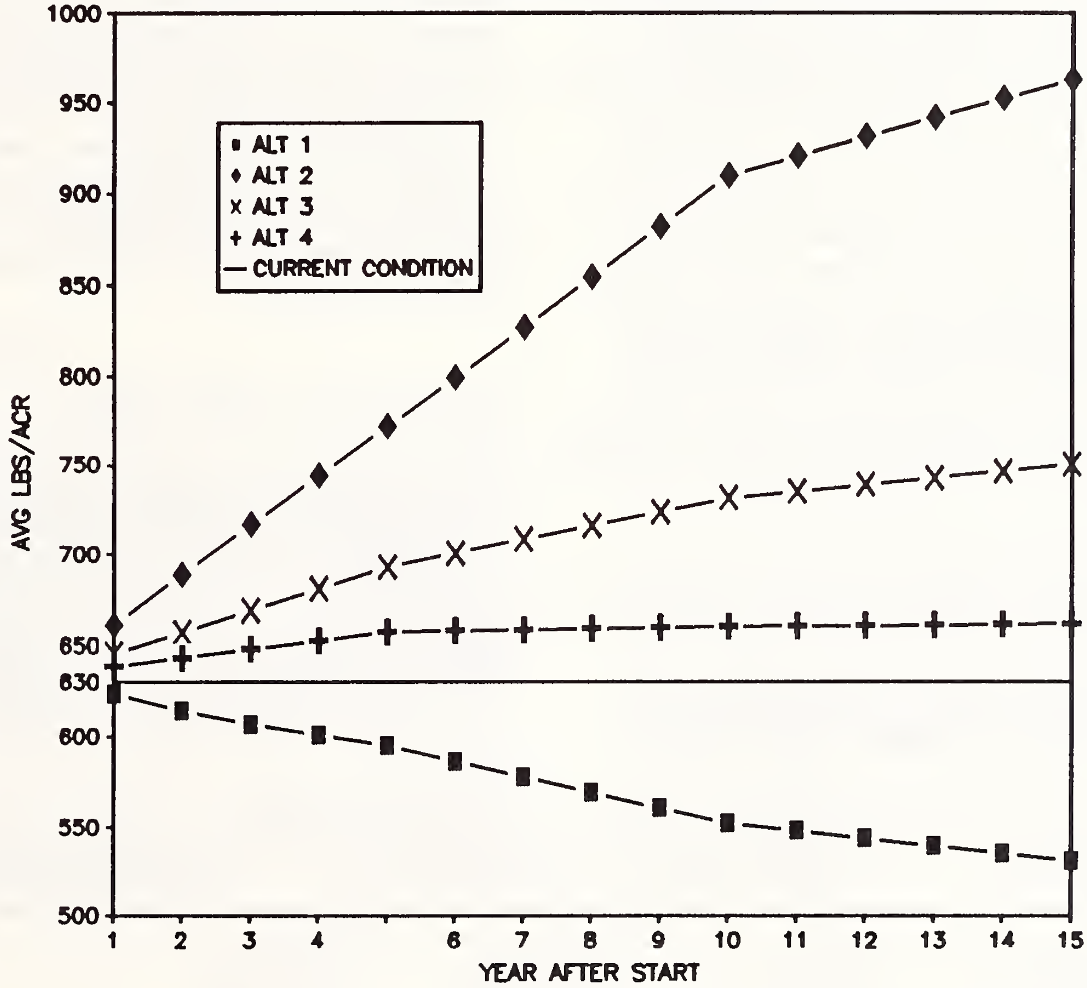
The economically preferred alternative varies depending on the value assigned to an AUM. When an AUM is figured at $1.86 the No Action alternative is the least costly alternative, but when an AUM is valued at $8.65 the 30 Year Rotation is least costly. The point at which the No Action and 30 Year Rotation alternatives are economically equivalent is approximately $6.40/AUM. That is slightly below the RPA estimated AUM rental value, which in 1990 dollars is $6.42/AUM.

SENSITIVITY ANALYSIS

Additional analysis was conducted to evaluate the effect of assigning a monetary value to (1)the change in forage available remaining after allotment use, and (2)the development of a new allotment plan required by a decrease in the permitted AUMs for the area. The following is a summary of the sensitivity analysis, refer to the project file for additional details.

Each alternative, including the No Action alternative, will change the amount of forage remaining after allotment use from current levels. This change in remaining forage probably would impact other resources, such as wildlife habitat, soil stability, and watershed conditions, however, assigning a specific dollar value to this forage is not practical. So instead of trying to define a specific value for the remaining forage, this analysis determined the range of values for the remaining forage were each alternatives is economically preferred. The analysis considered only the increase or decrease in remaining forage from current conditions caused by the different alternatives. Figure A2 displays the change in remaining forage over time by alternative.

FIGURE A2. AVERAGE REMAINING FORAGE PER ACRE AFTER ALLOTMENT USE ON ACRES UNDER BURN MANAGEMENT



The analysis was conducted with the allotment forage set at $1.86/AUM and the value of the remaining forage allowed to vary as needed to cause each alternative to become economically preferred. (The $1.86 value was used because the No Action alternative could never be the preferred alternative if the $8.65 value was used. Also, since the three action alternatives have the same allotment use of 14185 AUMs, the determination of which is economically preferred based on the remaining forage is independent of the allotment AUM value. This means that the range of values shown below where each action alternative is preferred would be the same if the allotment AUM value was $1.86, $8.65, or any other value.) Table A2 displays the results of this part of the sensitivity analysis.

Table A2. Economically Preferred Alternative Based on Value of Remaining Forage (Allotment AUM Value of $1.86)

Preferred Alternative	Value of Remaining Forage ($/AUM)
No Action	0.00 - 1.20
30 Year Rotation	1.21 - 1.40
20 Year Rotation	1.41 - 1.75
10 Year Rotation	1.76 and Above

The second part of the sensitivity analysis evaluated the effect that the cost of doing a new allotment plan would have on the No Action alternative. Based on the decrease in permitted allotment AUMs, the No Action alternative would require a new allotment plan within 5 years. The analysis was conducted with allotment AUMs valued at $1.86 and the remaining forage having no additional value. Assuming that an allotment plan was started and completed in the fifth year, if the cost of developing the new plan was approximately $50,000 or more then the 30 Year Rotation alternative would be preferred to the No Action alternative. If the cost was less then $50,000 then the No Action alternative remained the economically preferred.

Economic Analysis of Alternatives at the Steady State Phase

At the end of the 15 year transition phase, each alternative reaches a steady state of forage production and management costs. The economic analysis for this phase consisted of determining the net value for one year's worth of costs and benefits (undiscounted) to compare the performance of the alternatives where only the forage used in allotment AUMs is valued. Then, a sensitivity analysis was conducted on the value of the remaining forage to determine how those values effect the determination of the economically preferred alternative.

CALCULATION OF NET VALUE

The net value for each alternative was calculated by determining the average yearly cost of burning for the action alternatives, and the foregone benefits (treated as a cost) of the reduced forage production of the No Action alternative. As in the transition phase, both the fee value ($1.86), and the estimated market value ($8.65) were used in the calculation of net value. Table A3 shows the results.

Table A3. Steady State Phase Net Values

Alternative	Burning Costs	AUM Fee Value	AUM Market Value
No Action	None	-$3,398	-$15,804
10 Year Rotation	-$15,120	No Change	No Change
20 Year Rotation	-$7,560	No Change	No Change
30 Year Rotation	-$5,040	No Change	No Change

The No Action alternative is the only alternative effected by the difference in AUM value since that is the only alternative that has a change in the number of permitted AUMs from current conditions. As was the case in the transition phase analysis, the No Action alternative is economically preferred at the $1.86 value and the 30 Year Rotation Alternative is preferred at the $8.65 value. The value where the two alternatives have equivalent economic performance is at approximately $2.65/AUM.

SENSITIVITY ANALYSIS

This analysis was conducted to determine how changes to the value of the forage remaining after allotment use effects the determination of the economically preferred alternative. The analysis considered only the increase or decrease in remaining forage from current conditions caused by the different alternatives. The value of on allotment AUM was set at $1.86 for the same reasons as stated above in the transition phase sensitivity analysis, and the value of the remaining forage was allowed to vary so that each alternative was economically preferred. Table A4 displays the results of the sensitivity analysis.

Table A4. Economically Preferred Alternative Based on Value of Remaining Forage (Allotment AUM Value of $1.86)

Preferred Alternative	Value of Remaining Forage ($/AUM)
No Action	0.00 - 0.32
30 Year Rotation	0.33 - 0.73
20 Year Rotation	0.74 - 0.92
10 Year Rotation	0.93 and Above

Conclusions

The No Action Alternative is economically preferred only when the value of an allotment AUM is well below its estimated consumer surplus value, which is the generally accepted value to use in an economic evaluation. When you consider the cost of changing the allotment plan that this alternative would require and the value of the forage remaining after allotment use, it is difficult to justify the No Action alternative on an economic basis.

The determination of which action alternative is economically preferred depends on the value associated with the forage remaining after allotment use, since they all maintain the current allotment stocking level. In the sensitivity analysis done above, a range of values was given for this forage where each alternative was economically preferred.

Another way of looking at the value of the additional remaining forage would be to evaluate the need to increase the amount of forage above what currently remains after allotment use. If the current condition is good, then the 30 Year Rotation alternative is preferred since it essentially maintains the current condition (the average increase in remaining forage is about 20 pounds per acre). If additional forage is desired, then the 20 Year Rotation alternative will supply about 100 pounds of additional forage per acre, while the 10 Year Rotation will supply over 300 pounds of additional forage per acre.

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APPENDIX B

Biological Assessment - Threatened and Endangered Species

GRAVELLY SAGEBRUSH EIS

A. Situation Description

A preferred alternative has been selected by the U.S. Forest Service in its draft Environmental Impact Statement for burning sagebrush in the Gravelly Mountains on Madison District. The proposal is to prescribe burn approximately 1512 acres every year in the West Fork and Antelope Basin areas. This acreage will be made up of several individual burn units distributed over the area. Size of the units varies from 20 to 625 acres. On an average, each of the burn units would contain a mosaic of approximately 50% burned and 50% unburned resulting in an average of approximately 756 of the 1512 acres actually blackened.

The burns would take one or two days to complete each spring or fall. There would be up to three trucks involved in transporting workers to complete the burn. Burns would be done on the ground by hand. Noise level would be insignificant.

The average acres to be burned in this proposal is very similar to the past 5 year average burned for the area. This alternative differs from current management in the following ways: The 50% mosaic is a less intense burn than has been previously done. Average burn has been closer to 60% of total consumption of the vegetation in the unit. The main difference in this proposal is the presence of a plan to put the burn units into a systematic 20 year cycle. This allows for better analysis of cumulative impacts.

B. Geographic Description and Background

The affected area includes the 161,170 acres of land found in the West Fork/Antelope Basin area. The land is in Madison and Beaverhead counties in southwest Montana. The area includes Standard Creek and the Chain of Lakes; Elk Lake to Smith. The elevations range from 6,000 feet to 10,000 feet on the Gravelly crest. The topography of the area is varied and diverse. There are high open plateaus, mesas and rough rocky mountainous terrain, large open valley bottoms and high flat benches and open basins. The vegetation runs from grassland and wet meadows to sagebrush/grass slopes, to willow and aspen stands, to open conifer/grass stands to dense coniferous forests. The proposed action is confined to the 42,168 acres of sagebrush/grass stands vegetation. Lesser areas of open conifer/grass and aspen are also proposed to be treated.

For the purposes of this evaluation, the effects are considered for the T&E species found within the entire Gravellies.

C. Species of Concern

In a letter to the District Ranger on September 14, 1990, the U.S. Fish and Wildlife Service identified four species that should be considered in the Biological Evaluation. These include: the threatened grizzly bear, the endangered grey wolf, bald eagle, and peregrine falcon. In addition to these species, sensitive species as identified by the Regional Forester are evaluated for their predicted responses to the proposed action.

Grizzly bear

None of the Gravellies are within any Grizzly Bear Recovery area. The nearest recovery areas are the east side of the Madison drainage north of the Wedge near Indian Creek and in Idaho on the Targhee National Forest.

The Gravelly mountains have had grizzly bear sightings nearly every year however. As of November, 1990 there have been 29 confirmed grizzly bear sightings within the Gravelly Mountains. In addition, there are numerous sightings which have been unconfirmed.

Grizzly bears have been occasionally reported near Wade Lake and one reported just south of Antelope Basin in 1987. In 1990, a grizzly bear was found in the Granite Mountain area and a grizzly was also seen at Cliff Lake and later in the summer in the campgrounds of Cliff and Wade Lake.

This area has not been analyzed through the grizzly bear habitat process, but it appears that the Cliff Lake Natural Area, Elk River, Deer and Elk Mountain, and Red Rock Mountain areas have the potential to hold bears for at least part of the year. Conflicts with grazing and the transportation system probably are the limiting factors for the grizzly bear in these areas.

Based on the number of sightings, I feel we have at least a remnant population within this mountain range. *The Gravellies are therefore all considered to be occupied grizzly bear habitat.*

The diet for grizzly bears in this area include forbs, sedges, grasses, roots, berries, and pine nuts. They also eat fish, ground squirrels and other rodents, ungulates, carrion, and insects. In the spring grasses, forbs are the dominate food items in this area. In the fall, forbs, sedges, berries, pine nuts and insects become more important.

There has been one grizzly bear mortality on the district in recent years. Grizzly bear #121 was trapped on July 28, 1986 (his 3rd trapping in 2 years) near Black Butte. The bear, a 6 year old boar, had reportedly been killing sheep prior to each of his 3 trappings. After the 3rd trapping, he was transported to Bozeman where he was to be moved to the Flathead National Forest for release the following day. While examining the bear in Bozeman, state officials determined the bear had badly damaged teeth. State Fish and Wildlife officials feared the bear might be a threat to humans and therefore killed the bear.

Grey wolf

Wolf have been regularly reported in the Gravelly and Tobacco Root ranges, the last report 2 years ago on the Madison district side. A total of 180 sightings have been reported on the Beaverhead since 1964. None of the sighting can be considered as confirmed. Most sightings have been one or two animals, with young rarely seen. No pack activity has been reported, so the population is low (if they are present at all) with at most a few individuals scattered in the Gravellies.

The main source of biomass in their diet come from the large ungulates, primarily elk, deer, moose. Smaller mammals such as rabbits and ground squirrels make up a small part of their diet.

Bald Eagle

The bald eagle is a resident in the Gravelly mountains, nesting along the east side near the Madison River and the Chain of Lakes area. The bird also nests in the Centennial Valley at Lima Reservoir and at Red Rocks Wildlife Refuge.

Bald eagles nest on the Chain of Lakes and do feed to some extent in the areas proposed for burning. Studies made during 1989 and 1990 indicate that early in the summer, eagles will occasionally hunt to the east of Elk lake (an area which was burned in 1986) and to the east of Hidden Lake. These areas are classified as Zone 3 (home range) for the birds nesting at Hidden and Elk Lake. There is a burn unit on the west side of Elk lake which is within 1/2 mile from the Elk Lake nest. This burn unit is named Elk Lake #5.

The Antelope Prong and Neely's arm of Cliff lake are important fishing areas for both nesting and immature eagles during the spring rainbow and sucker spawning runs.

In the Chain of Lakes area, fish are the primary food source with ducks and muskrats of seasonal importance. Ground squirrels have only sporadically been observed to have been taken.

Peregrine falcon

Peregrine falcons nest in the Centennial Valley though there are no known nest sites in the Gravellies. The basic habitat requirements of peregrine falcons, namely large cliffs with ledges or potholes for nesting, is present along the West Fork of the Madison and along the Chain of Lakes area. Field surveys in 1989 and 1990 failed to locate any falcons nesting there though several falcons have been seen near Cliff Lake. There is a strong likelihood that these birds will be nesting on the forest in the next few years.

Present prey species for the peregrines include: swallows, swifts, waterfowl, and a variety of passerines. Mammal populations are not important for the peregrines.

Sensitive wildlife species that may be in the area include the trumpeter swan, boreal owl, harlequin duck, ferruginous hawk, and the western big-eared and spotted bats.

Trumpeter swan

Trumpeter swan, a sensitive species, nests on Elk lake (2 historical nest sites) and have historically also nested on Goose Lake. Swans will winter on the south end of Cliff Lake until the lake totally freezes up. Conklin Lake, a privately owned lake in Antelope Basin, has consistently had a pair of swans nesting on it every year. In 1990, 4 young were hatched from their nest on the west end of the lake, and 2 birds fledged. Their activities are completely restricted to the lake until after fledging. There are 2 burn units within 200 yards of the 1990 nest site. (The units are named Conklin Pothole #4 and Conklin Sheepfield #3.)

Boreal Owl

Boreal owl probably are present in the upper elevations though none have been found. The birds typically are found in old growth lodgepole or spruce. This habitat preference separates them from any of the proposed burns.

Harlequin duck

Harlequin duck is not known to have ever been present in Gravellies. Their preference for large fast moving streams make it unlikely that any harlequins have ever been present in the area. (Recent research has questioned this apparent preference though undisturbed streams of at least 6 feet in width still seem to be preferred.)

Ferruginous hawk

Ferruginous hawk are present in the West Fork and are fairly common. No nests have been found in the analysis area however. They are known to be nesting in the sagebrush dominated hillsides just south of the upper end of the West Fork allotment in the Centennial Valley. Lagomorphs are the most common prey and comprise most of the bird's prey biomass. Nesting preference is for trees in shrubland/grassland habitat though they will nest in stream bottoms or on the ground where trees are not available.

Western big-eared and spotted bats

Western big-eared bat and spotted bats are 2 species which there is not much data gathered on, either here or elsewhere. Spotted bat appears to be an arid dwelling mammal which may be present in the southern Gravellies but they have never been observed. Potential roosting habitat would be in the potholes and cracks in the cliffs along the Chain of Lakes. Spotted bats apparently tend to feed and roost individually unlike most other species of bats which have communal roosts. Consequently, no one roost is of major importance. Western big-eared bat is likewise unknown as to its presence in the Gravellies. Red Rock Refuge personnel do not have any records of these 2 bats being within the refuge. This species has communal roosts, often in caves or mine shafts where a group of bats could roost together from the open ceiling, not in cracks or crevices like other bat species. None of the bats which have been seen while exploring caves or old mines exhibited this behavior of roosting from the ceiling. Consequently, the bats which have been seen are believed to be a different species. There appears to be little overlap between these bats and the proposed project.

D. Project Effect Analysis

The guidelines listed in the Greater Yellowstone Grizzly Bear Recovery Plan do not cover the Gravellies as it is outside all recovery areas. However, endangered and threatened species are protected regardless of where they occur. If a grizzly bear occurs outside a recovery area, provisions must be made to protect it from harm and harassment, although management of habitat for grizzlies is not necessary. Because the grizzly bear is a threatened species, it is protected under the restrictions listed in the Endangered Species Act of 1973.

The Draft revised recovery plan covers this point. "It is recognized that grizzly bears will occasionally move and even reside permanently in areas outside the recovery zone. As long as the species remains listed as threatened in the adjacent ecosystem, any bears outside the recovery zone are protected by Federal statute against illegal killing. Management efforts such as pursuit and capture will not be directed against grizzly bears outside the recovery zone if such bears do not come into conflict with people or domestic livestock. It is recognized that such areas are not primarily managed for grizzly bear use. Bears that come into conflict with man under the nuisance bear criteria in the Guidelines (1986) outside the recovery zone will be captured and relocated into the recovery zone under the Guidelines. Removal of nuisance bears outside the recovery zone by authorized agency action is necessarily more lenient than within the recovery zone." (U.S. Fish and Wildlife Service 1990).

Prescribe burning has minimal impact on the grizzly or its habitat. It is not likely to increase the possibility of conflict between the bear and people. The vegetation change which would occur as a result of the proposed level of burning is not likely to impact feeding by the bears in any significant way. There will be a shift of herbaceous plants towards the forbs, rhizomatous and coarse leaved bunchgrasses and a decrease in annuals and fine leaved bunchgrasses. This flush of new growth generally remains high for the first few years after treatment. These plants are highly palatable to grazing animals. The resulting vegetation composition would actually be composed of more plants of the species which grizzly bears prefer (forbs and rhizomatous plants). The impact of this temporary vegetation change will be minimal to grizzly bear however. They may be attracted to the burns in the spring but the benefits are not significant. During the burning, there might be some displacement for the day or two that it takes to complete the burn but again this displacement is very local in nature and insignificant.

Fire scars in timbered areas in southwest Montana including Yellowstone National Park have shown fire frequency to be approximately 20 to 45 years. Fire frequency within the adjacent sagebrush/grasslands may be even shorter. Given this, a fire frequency of 20 years is not a significant divergence from the natural burning cycle, a cycle which the local population of bears has been able to live with.

While confirmed wolf sightings are not present on either district, the possibility exists of their presence. Burning will not significantly affect on what few wolves that may be present. The possibility of temporary displacement from the burn area resulting from the day or two of burning is very local, is unlikely, and therefore insignificant.

The change in vegetation on the acres treated will alter the distribution of some potential prey species for the wolf and the other T&E species, but this shift plus any small population change of small mammal prey species is not significant. Because the prey base is not likely to significantly change, and the disturbance is minor, the impacts of this prescribe burning is not likely to adversely affect the wolf.

Bald eagles could be affected by the proposed activity. A mitigation measures has been listed in the EIS to avoid disturbance during spring by requiring the proposed burning of the sage in Elk Lake Burn Unit #5 to be a fall burn to reduce disturbance to the Elk Lake nesting pair.

The burning of the unit at Antelope Prong called North Penninsula Unit 1 will result in displacement of the eagles feeding on the spawning fish for the day of the burn. The unit is small, only 65 acres and the burn can be accomplished in only a few hours. This temporary displacement does not jeopardize the eagles as they will move to Cliff Lake or to the other spawning grounds on Horn Creek and Lost Mine Canyon Creek. Similar displacement has been observed during the past

2 years as a result of other activities at this site and is not considered significant.

Bald eagles during fall are likely to avoid the burn area during the day or two that burning takes place but this displacement is local in nature and does not adversely affect the eagle. The minor change in small mammals as a result of the burn is not likely to affect the eagle.

There is no anticipated impact on peregrine falcons from this proposed project. The only possible exception would be if a pair decides to nest near one of the burn units. Every year, a nesting survey is done. If a nest is found, then a mitigation measure of no spring burning within one mile would need to be put into place. Peregrine falcons use the sagebrush areas only incidentally and there would be no significant reduction in prey base which could impact them indirectly.

Trumpeter swans could be affected unless the mitigation measures as listed are used. Because of the close proximity of the Conklin nest to Burn Units Conklin Sheepfield #3 and Conlkin Pothole #4, the burning in these units would need to be deferred to fall when the disturbance would be minimal. If this mitigation measure is followed, there will be no affect to the trumpeter swans.

Ferruginous hawks are very susceptible to abandonment if disturbed even minutely during egg laying and incubation (Olendorff 1973). A prescribe burn taking place within sight of the nest could easily cause desertion. Howard and Powers (1973) and Smith and Murphy (1973) all verify this tendency to abandon nests even from a disturbance as small as one visit by researchers from a distance. Snow (1974) recommended limiting or prohibiting human access to within 300 yards of the nests during the incubation period. Ferruginous hawk could be impacted by the alternatives through disturbance during nesting. The units west of Patchtop Mountain in the West Fork of Madison River have the highest likelihood of having nests nearby. In order to reduce the chance of impacting a nest, a survey prior to any burning would need to be made. Any burn unit within 300 yards of a nest would be deferred to burning in the fall. If this mitigation measure is followed, there will be no affect on ferruginous hawk. The burning is not likely to significantly alter the rabbit population if a 50% burn is achieved as planned. Consequently, there is no anticipated affect on the ferruginous hawk regarding their prey base.

Boreal owl, harlequin ducks, spotted bat and western big-eared bat should not be impacted in any way by the burning. There is no habitat overlap between their needs and the areas considered for burning. There will be no affect for these species.

In summary, based on the project as designed with the incorporated mitigation measures, the affects on the T&E species and sensitive species are insignificant and discountable and are not likely to adversely affect these species.

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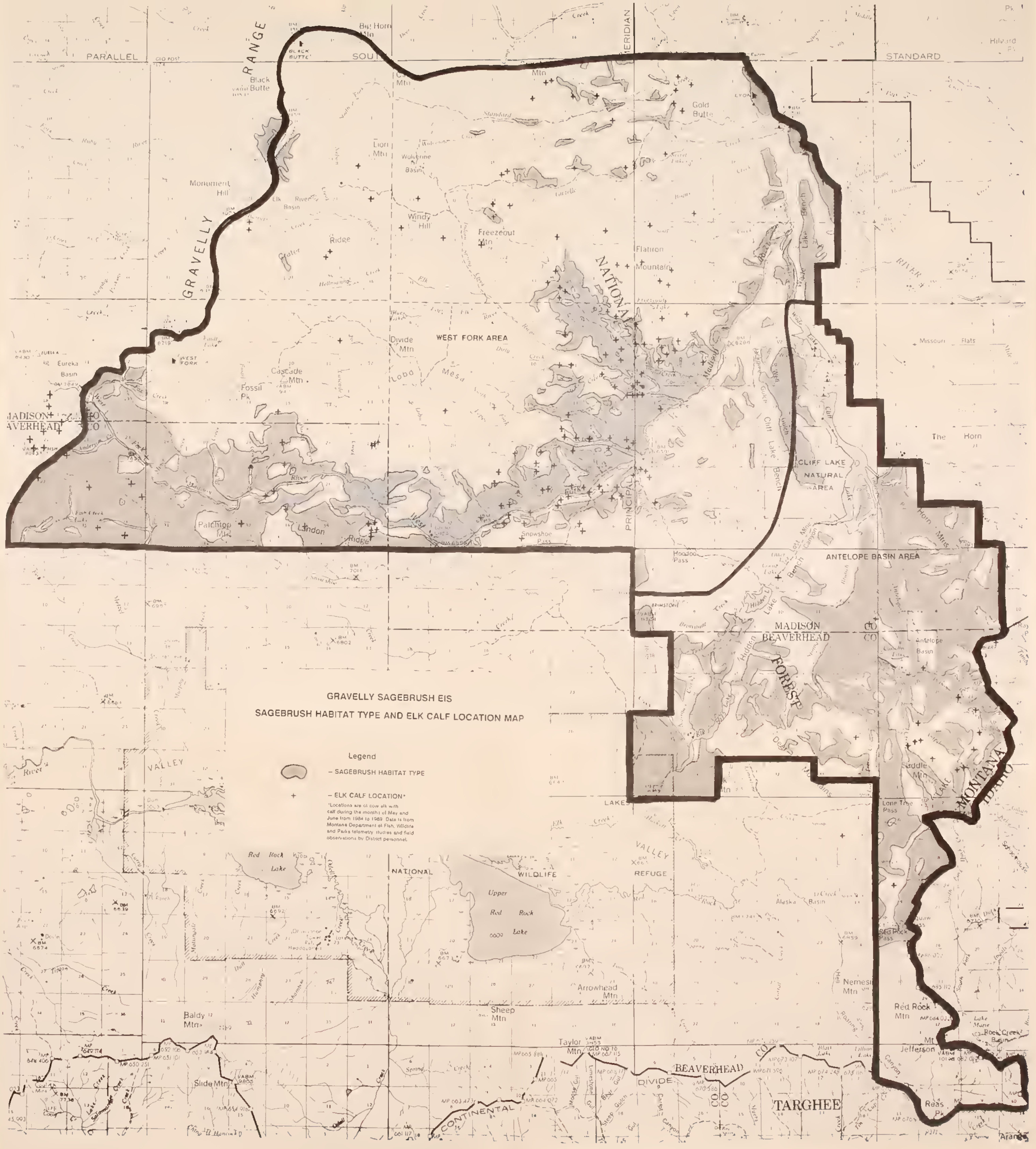


GRAVELLY SAGEBRUSH EIS

SAGEBRUSH HABITAT TYPE AND ELK CALF LOCATION MAP

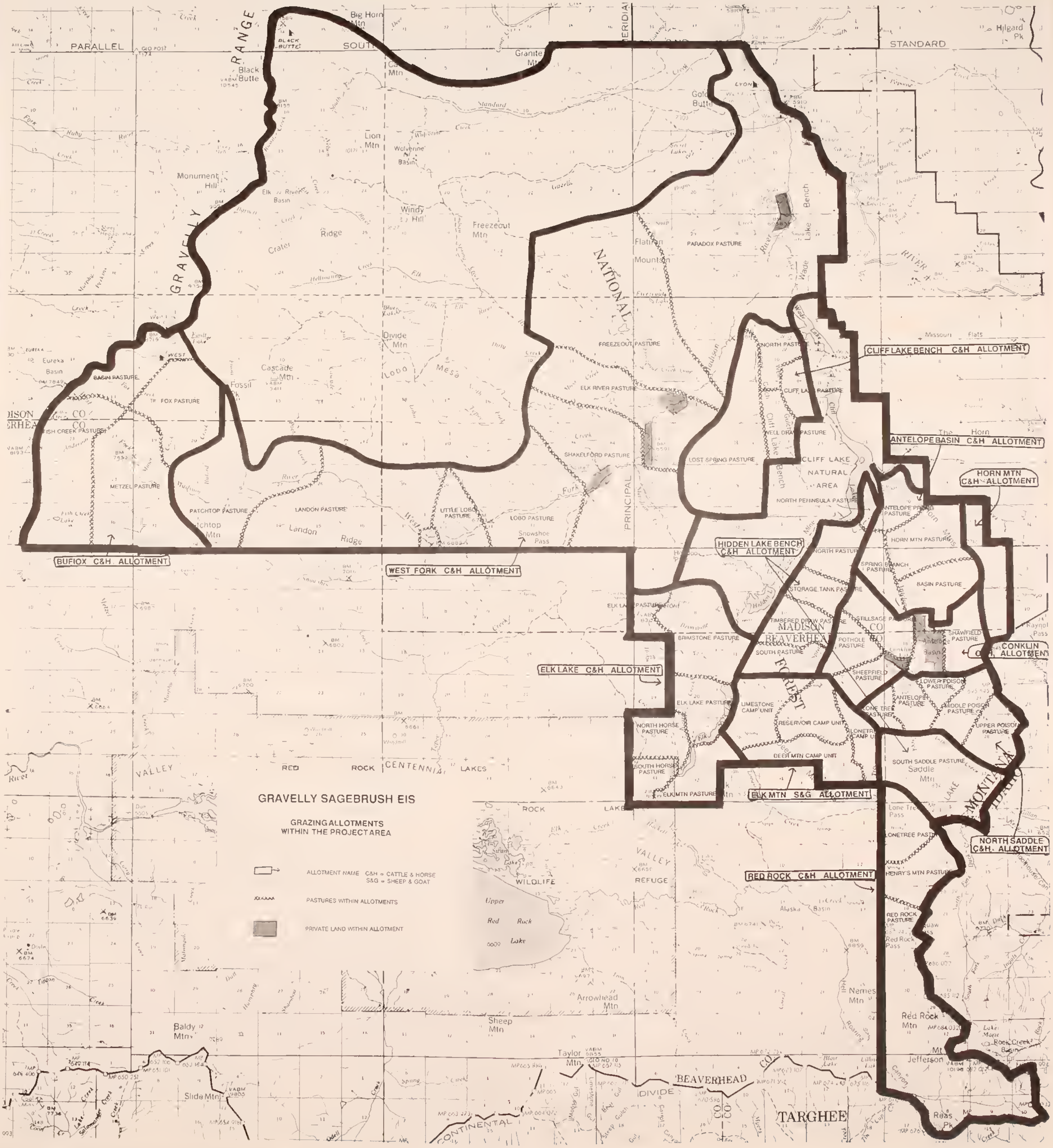
Legend

▨ – SAGEBRUSH HABITAT TYPE

+ – ELK CALF LOCATION*

*Locations are of cow elk with calf during the months of May and June from 1984 to 1989. Data is from Montana Department of Fish, Wildlife and Parks telemetry studies and field observations by District personnel.

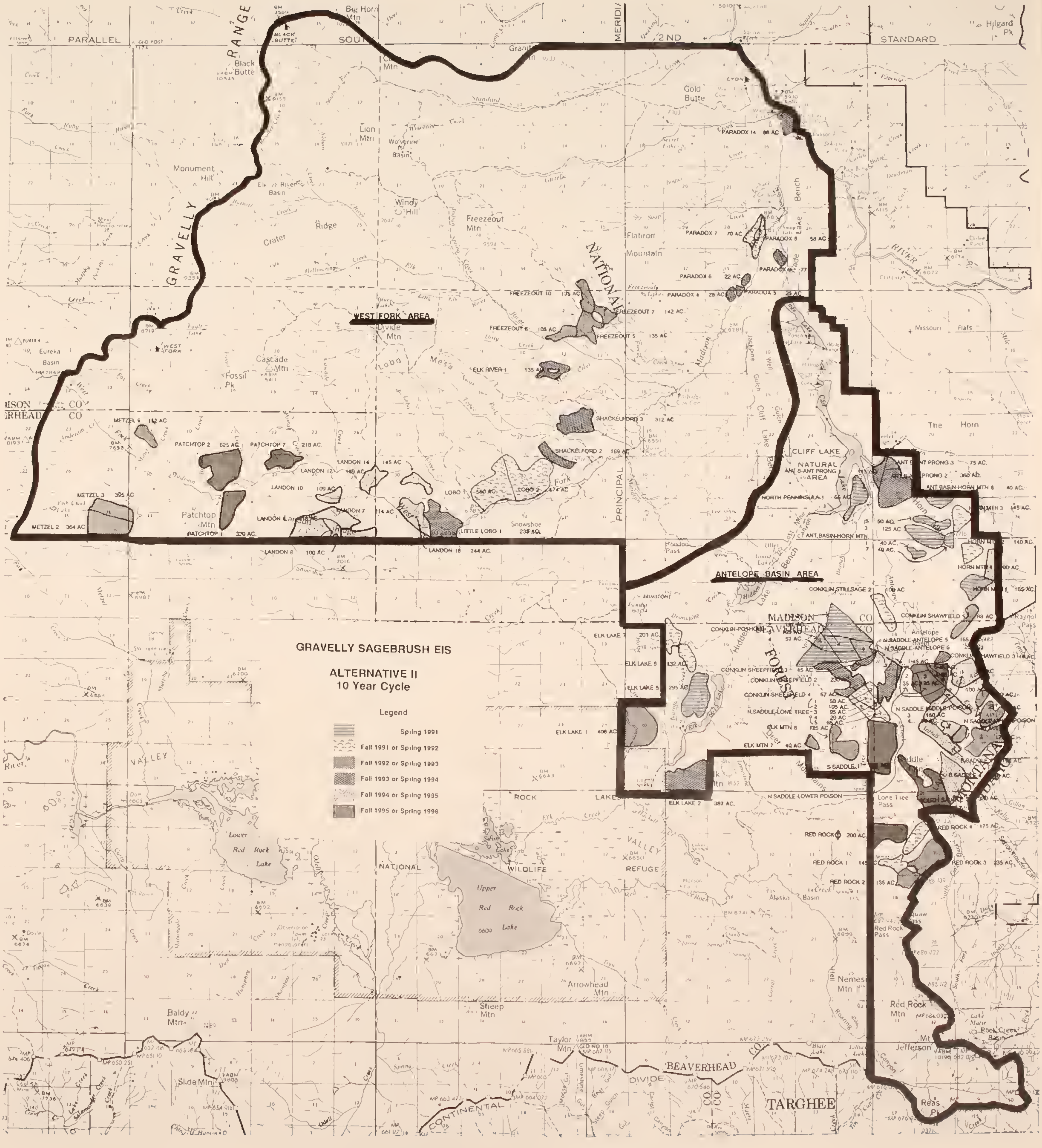
GRAVELLY
RANGE
WEST FORK AREA
ANTELOPE BASIN AREA
CLIFF LAKE NATURAL AREA
NATIONAL
FOREST
MADISON
BEAVERHEAD
CO
MONTANA
IDAHO
PRINCIPAL MERIDIAN
STANDARD PARALLEL SOUTH
RED ROCK LAKES NATIONAL WILDLIFE REFUGE
VALLEY
CONTINENTAL DIVIDE
TARGHEE
Black Butte
Big Horn Mtn
Monument Hill
Lion Mtn
Wolverine Basin
Gold Butte
Windy Hill
Freezeout Mtn
Flatiron Mountain
Ridge
Divide Mtn
Lobo Mesa
Cascade Mtn
Fossil Pk
Eureka Basin
West Fork
Patchtop Mtn
London Ridge
Snowshoe Pass
Hoodoo Pass
Cliff Lake Bench
Wade Lake
Missouri Flats
The Horn
Antelope Basin
Horn Mtns
Hidden Lake
Lone Tree Pass
Red Rock Pass
Alaska Basin
Upper Red Rock Lake
Red Rock Lake
Arrowhead Mtn
Sheep Mtn
Baldy Mtn
Slide Mtn
Taylor Mtn
Nemesis Mtn
Red Rock Mtn
Mt Jefferson
Reas Pk



GRAVELLY SAGEBRUSH EIS

GRAZING ALLOTMENTS WITHIN THE PROJECT AREA

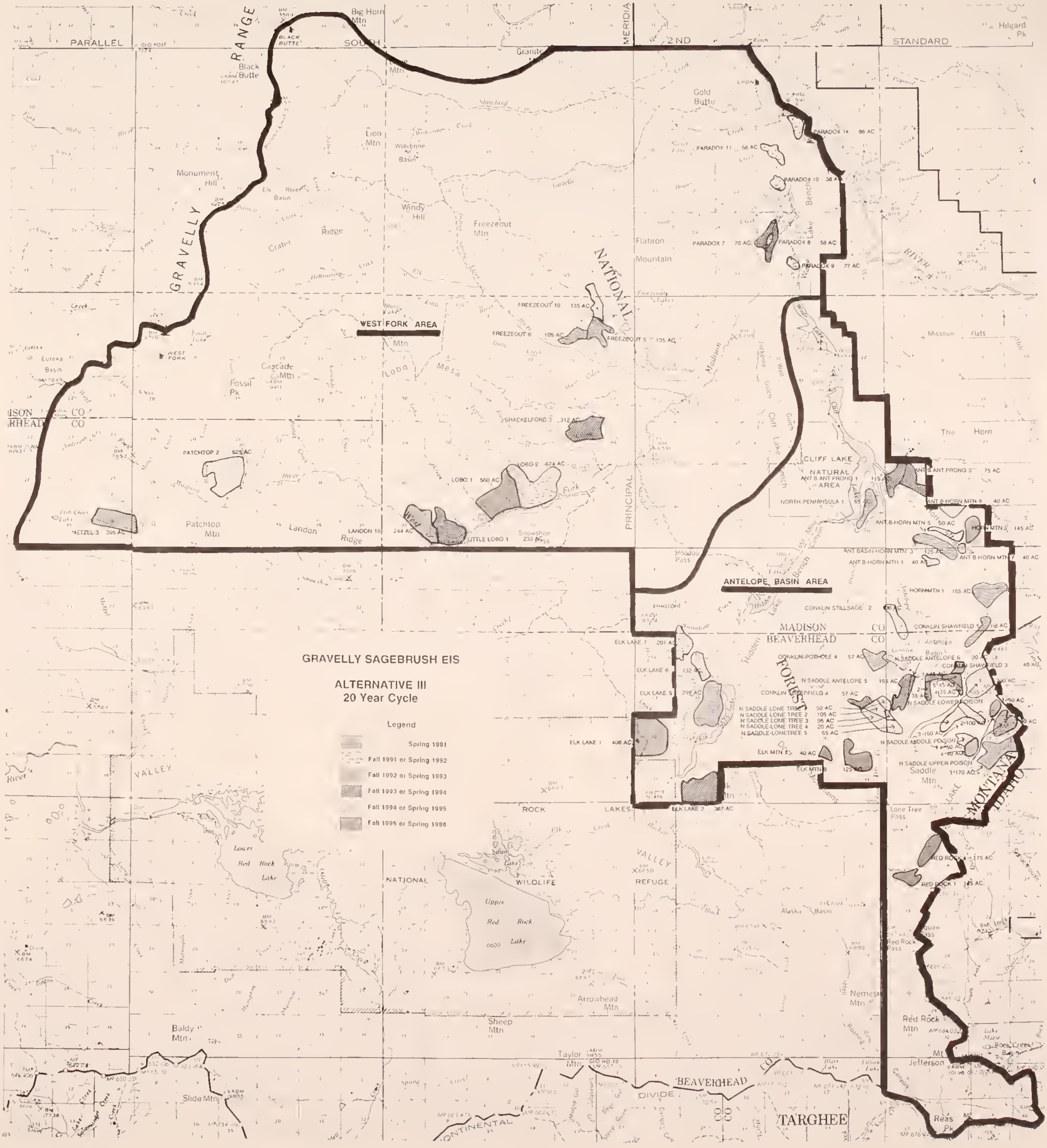
ALLOTMENT NAME C&H = CATTLE & HORSE S&G = SHEEP & GOAT
PASTURES WITHIN ALLOTMENTS
PRIVATE LAND WITHIN ALLOTMENT
BUFIOX C&H ALLOTMENT
WEST FORK C&H ALLOTMENT
HIDDEN LAKE BENCH C&H ALLOTMENT
ELK LAKE C&H ALLOTMENT
ELK MTN S&G ALLOTMENT
RED ROCK C&H ALLOTMENT
NORTH SADDLE C&H ALLOTMENT
CONKLIN C&H ALLOTMENT
HORN MTN C&H ALLOTMENT
ANTELOPE BASIN C&H ALLOTMENT
CLIFF LAKE BENCH C&H ALLOTMENT
GRAVELLY RANGE
NATIONAL FOREST
MADISON CO
BEAVERHEAD CO
MONTANA
IDAHO
CLIFF LAKE NATURAL AREA
RED ROCK LAKES WILDLIFE REFUGE
CENTENNIAL VALLEY
CONTINENTAL DIVIDE
TARGHEE
PRINCIPAL MERIDIAN
STANDARD PARALLEL SOUTH
BASIN PASTURE
FOX PASTURE
FISH CREEK PASTURE
METZEL PASTURE
PATCHTOP PASTURE
LANDON PASTURE
LITTLE LOBO PASTURE
LOBO PASTURE
SHAKELFORD PASTURE
ELK RIVER PASTURE
FREEZEOUT PASTURE
PARADOX PASTURE
NORTH PASTURE
CLIFF LAKE PASTURE
WELL DRAW PASTURE
LOST SPRING PASTURE
NORTH PENINSULA PASTURE
ANTELOPE PASTURE
HORN MTN PASTURE
SPRING BRANCH PASTURE
BASIN PASTURE
STORAGE TANK PASTURE
TIMBERED DRAW PASTURE
STILLSAGE PASTURE
SHAWFIELD PASTURE
BRIMSTONE PASTURE
POTHOLE PASTURE
SOUTH PASTURE
SHEEPFIELD PASTURE
LOWER POISON PASTURE
ANTELOPE PASTURE
MIDDLE POISON PASTURE
UPPER POISON PASTURE
LONE TREE PASTURE
ELK LAKE PASTURE
LIMESTONE CAMP UNIT
RESERVOIR CAMP UNIT
LONETREE CAMP UNIT
DEER MTN CAMP UNIT
NORTH HORSE PASTURE
SOUTH HORSE PASTURE
ELK MTN PASTURE
SOUTH SADDLE PASTURE
LONETREE PASTURE
HENRY'S MTN PASTURE
RED ROCK PASTURE



GRAVELLY SAGEBRUSH EIS

ALTERNATIVE II
10 Year Cycle

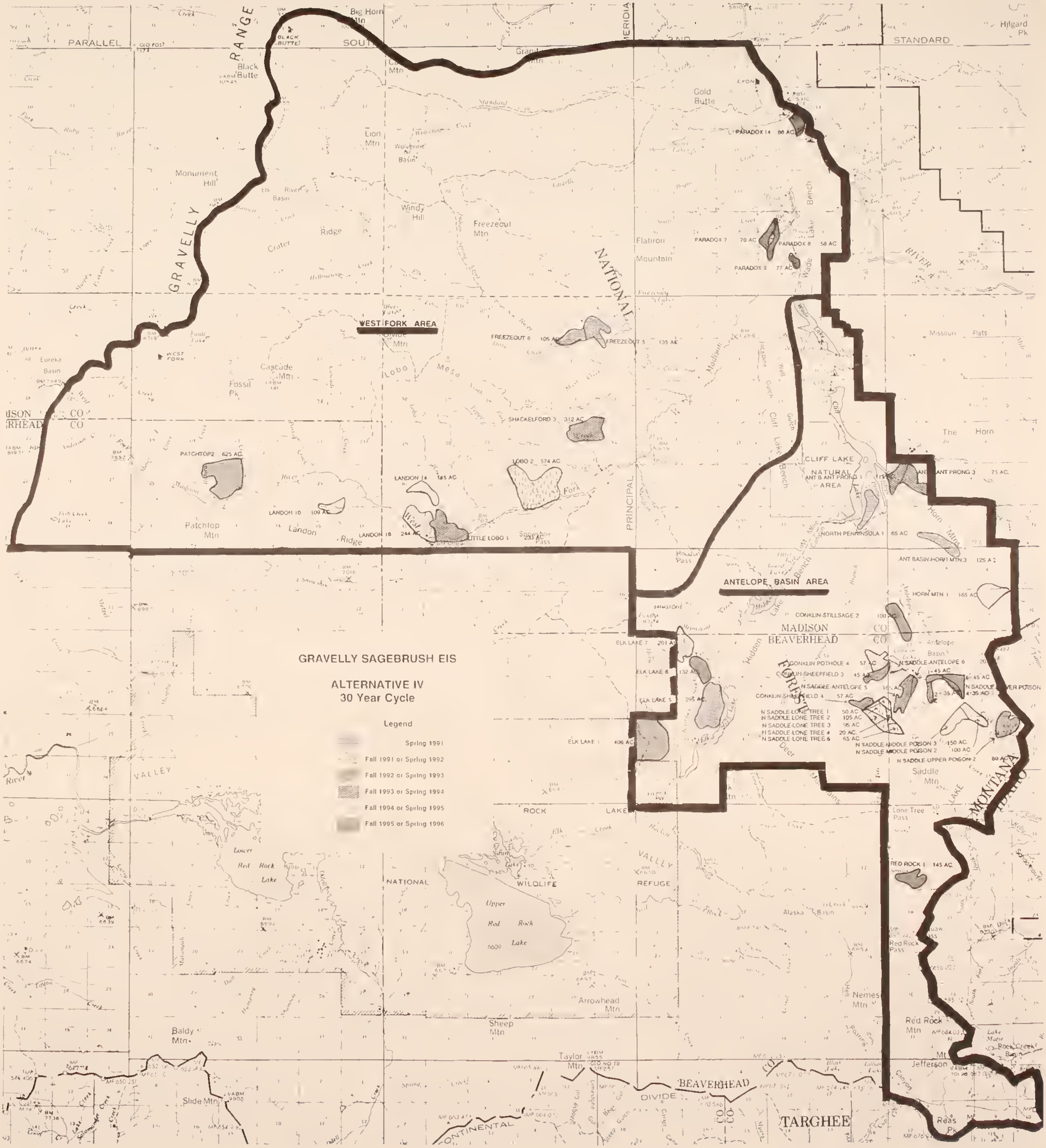
Legend
Spring 1991
Fall 1991 or Spring 1992
Fall 1992 or Spring 1993
Fall 1993 or Spring 1994
Fall 1994 or Spring 1995
Fall 1995 or Spring 1996
WEST FORK AREA
ANTELOPE BASIN AREA
CLIFF LAKE NATURAL AREA
GRAVELLY RANGE
NATIONAL FOREST
MADISON CO
BEAVERHEAD CO
TARGHEE
CONTINENTAL DIVIDE
RED ROCK LAKES NATIONAL WILDLIFE REFUGE
Upper Red Rock Lake
Lower Red Rock Lake
STANDARD PARALLEL SOUTH
2ND PRINCIPAL MERIDIAN
METZEL 2 364 AC
METZEL 3 395 AC
METZEL 9 152 AC
PATCHTOP 1 320 AC
PATCHTOP 2 625 AC
PATCHTOP 7 218 AC
LANDON 7 214 AC
LANDON 8 100 AC
LANDON 10 109 AC
LANDON 12 149 AC
LANDON 14 145 AC
LANDON 18 244 AC
LITTLE LOBO 1 233 AC
LOBO 1 560 AC
LOBO 2 674 AC
SHACKELFORD 2 169 AC
SHACKELFORD 3 312 AC
ELK RIVER 1 135 AC
FREEZEOUT 5 135 AC
FREEZEOUT 6 105 AC
FREEZEOUT 7 142 AC
FREEZEOUT 10 135 AC
PARADOX 4 28 AC
PARADOX 5
PARADOX 6 22 AC
PARADOX 7 70 AC
PARADOX 8 58 AC
PARADOX 14 86 AC
ELK LAKE 1 406 AC
ELK LAKE 2 387 AC
ELK LAKE 5 295 AC
ELK LAKE 6 132 AC
ELK LAKE 7 201 AC
ELK MTN 7 40 AC
ELK MTN 8 125 AC
S SADDLE 1
N SADDLE LOWER POISON
N SADDLE LONE TREE
N SADDLE ANTELOPE 5
N SADDLE ANTELOPE 6
N SADDLE POISON
CONKLIN STILLSAGE 2 100 AC
CONKLIN SHAWFIELD 3
CONKLIN SHEEPFIELD 2
CONKLIN SHEEPFIELD 3 45 AC
CONKLIN SHEEPFIELD 4 57 AC
CONKLIN POISON
HORN MTN 1 165 AC
HORN MTN 3 145 AC
HORN MTN 4 100 AC
HORN MTN 5 140 AC
ANT BASIN-HORN MTN
ANT BASIN-HORN MTN 8 40 AC
ANT B-ANT PRONG 1
ANT B-ANT PRONG 2 360 AC
ANT B-ANT PRONG 3 75 AC
NORTH PENINSULA 1 65 AC
RED ROCK 1 145 AC
RED ROCK 2 135 AC
RED ROCK 3 235 AC
RED ROCK 4 175 AC
RED ROCK 200 AC
Black Butte
Big Horn Mtn
Gold Butte
Lion Mtn
Monument Hill
Windy Hill
Freezeout Mtn
Flatiron Mountain
Crater Ridge
Divide Mtn
Lobo Mesa
Cascade Mtn
Fossil Pk
Patchtop Mtn
Eureka Basin
Missouri Flats
The Horn
Hoodoo Pass
Raynolds Pass
Lone Tree Pass
Alaska Basin
Red Rock Pass
Nemesis Mtn
Red Rock Mtn
Mt Jefferson
Reas Pk
Arrowhead Mtn
Sheep Mtn
Taylor Mtn
Baldy Mtn
Slide Mtn
Hilgard Pk



GRAVELLY SAGEBRUSH EIS

ALTERNATIVE III
20 Year Cycle

Legend
Spring 1991
Fall 1991 or Spring 1992
Fall 1992 or Spring 1993
Fall 1993 or Spring 1994
Fall 1994 or Spring 1995
Fall 1995 or Spring 1996
WEST FORK AREA
ANTELOPE BASIN AREA
GRAVELLY
RANGE
NATIONAL
FOREST
PRINCIPAL
MERIDIAN
2ND
STANDARD
PARALLEL
SOUTH
MADISON CO
BEAVERHEAD CO
MONTANA
IDAHO
CONTINENTAL
DIVIDE
BEAVERHEAD
TARGHEE
RED ROCK LAKES NATIONAL WILDLIFE REFUGE
VALLEY
CLIFF LAKE NATURAL AREA
PARADOX 14 86 AC
PARADOX 11 58 AC
PARADOX 10 38 AC
PARADOX 7 70 AC
PARADOX 8 58 AC
PARADOX 9 77 AC
FREEZEOUT 10 135 AC
FREEZEOUT 6 105 AC
FREEZEOUT 5 135 AC
SHACKELFORD 3 312 AC
PATCHTOP 2 625 AC
LOBO 2 574 AC
LOBO 1 560 AC
METZEL 3 395 AC
LANDON 18 244 AC
LITTLE LOBO 1
Snowshoe 233 AC Pass
ANT B ANT PRONG 3 75 AC
ANT B ANT PRONG 1 115 AC
NORTH PENNINSULA 1 65 AC
ANT B HORN MTN 6 40 AC
ANT B-HORN MTN 5 50 AC
HORN MTN 3 145 AC
ANT BASIN-HORN MTN 3 125 AC
ANT B-HORN MTN 7 40 AC
ANT B-HORN MTN 1 40 AC
HORN MTN 1 165 AC
CONKLIN STILLSAGE 2 60 AC
CONKLIN SHAWFIELD 5 18 AC
CONKLIN-POTHOLE 4 57 AC
N SADDLE ANTELOPE 6 20 AC
CONKLIN SHAWFIELD 3 40 AC
N SADDLE ANTELOPE 5 165 AC
CONKLIN SHEPFIELD 4 57 AC
N SADDLE LOWER POISON
N SADDLE LONE TREE 1 50 AC
N SADDLE LONE TREE 2 105 AC
N SADDLE LONE TREE 3 95 AC
N SADDLE LONE TREE 4 20 AC
N SADDLE LONETREE 5 65 AC
N SADDLE SADDLE POISON
N SADDLE UPPER POISON
ELK MTN 11 40 AC
ELK MTN 8 125 AC
ELK LAKE 7 201 AC
ELK LAKE 6 132 AC
ELK LAKE 5 295 AC
ELK LAKE 1 408 AC
ELK LAKE 2 387 AC
RED ROCK 4 175 AC
RED ROCK 1 185 AC
Big Horn Mtn
Black Butte
Granite Mtn
Gold Butte
Lion Mtn
Wolverine Basin
Monument Hill
Elk River Basin
Windy Hill
Freezeout Mtn
Crater Ridge
Flatiron Mountain
Eureka Basin
Cascade Mtn
Fossil Pk
Lobo Mesa
Patchtop Mtn
Landon Ridge
Hoodoo Pass
The Horn
Missouri Flats
Hilgard Pk
Antelope Basin
Saddle Mtn
Lone Tree Pass
Upper Red Rock Lake
Lower Red Rock Lake
Alaska Basin
Red Rock Pass
Nemesis Mtn
Red Rock Mtn
Jefferson Mtn
Reas Pk
Arrowhead Mtn
Sheep Mtn
Baldy Mtn
Taylor Mtn
Slide Mtn



GRAVELLY SAGEBRUSH EIS

ALTERNATIVE IV
30 Year Cycle

Legend
Spring 1991
Fall 1991 or Spring 1992
Fall 1992 or Spring 1993
Fall 1993 or Spring 1994
Fall 1994 or Spring 1995
Fall 1995 or Spring 1996
WEST FORK AREA
ANTELOPE BASIN AREA
CLIFF LAKE NATURAL AREA
PARADOX 14 86 AC
PARADOX 7 70 AC
PARADOX 8 58 AC
PARADOX 9 77 AC
FREEZEOUT 6 105 AC
FREEZEOUT 5 135 AC
SHACKELFORD 3 312 AC
LOBO 2 574 AC
LANDON 14 185 AC
LANDON 10 109 AC
LANDON 18 244 AC
LITTLE LOBO 1 233 AC
PATCHTOP2 625 AC
ANT B ANT PRONG 1 115 AC
ANT PRONG 3 75 AC
NORTH PENINSULA 1 65 AC
ANT BASIN-HORN MTN 3 125 AC
HORN MTN 1 165 AC
CONKLIN-STILLSAGE 2 100 AC
CONKLIN POTHOLE 4 57 AC
CONKLIN-SHEEPFIELD 3 45 AC
N SADDLE-ANTELOPE 5 16 AC
CONKLIN-SHEEPFIELD 4 57 AC
N SADDLE-ANTELOPE 6 1 - 45 AC
6 - 45 AC
2 - 35 AC
4 - 35 AC
N SADDLE-LOWER POISON
N SADDLE-LONE TREE 1 50 AC
N SADDLE LONE TREE 2 105 AC
N SADDLE-LONE TREE 3 95 AC
N SADDLE-LONE TREE 4 20 AC.
N SADDLE-LONE TREE 6 65 AC
N SADDLE-MIDDLE POISON 3 150 AC.
N SADDLE-MIDDLE POISON 2 100 AC
N SADDLE-UPPER POISON 2 80 AC
ELK LAKE 7 201 AC
ELK LAKE 6 132 AC
ELK LAKE 5 295 AC
ELK LAKE 1 406 AC
RED ROCK 1 145 AC
MADISON CO
BEAVERHEAD CO
GRAVELLY RANGE
NATIONAL FOREST
PRINCIPAL MERIDIAN
2ND STANDARD PARALLEL SOUTH
MONTANA
IDAHO
RED ROCK LAKES NATIONAL WILDLIFE REFUGE
VALLEY
TARGHEE
CONTINENTAL DIVIDE
BEAVERHEAD CO
Big Horn Mtn
Black Butte
Hilgard Pk
Gold Butte
Lion Mtn
Wolverine Basin
Monument Hill
Windy Hill
Freezeout Mtn
Crater Ridge
Flatiron Mountain
Wade Lake
Missouri Flats
River
Eureka Basin
Cascade Mtn
Fossil Pk
Lobo Mesa
Divide Mtn
West Fork
Patchtop Mtn
Landon Ridge
Snowshoe Pass
Cliff Lake Bench
The Horn
Horn Mtns
Antelope Basin
Hidden Lake
Saddle Mtn
Lone Tree Pass
Lower Red Rock Lake
Upper Red Rock Lake
Alaska Basin
Red Rock Pass
Nemesis Mtn
Red Rock Mtn
Arrowhead Mtn
Sheep Mtn
Baldy Mtn
Taylor Mtn
Slide Mtn
Jefferson Mtn
Reas Pk
Rock Creek Basin